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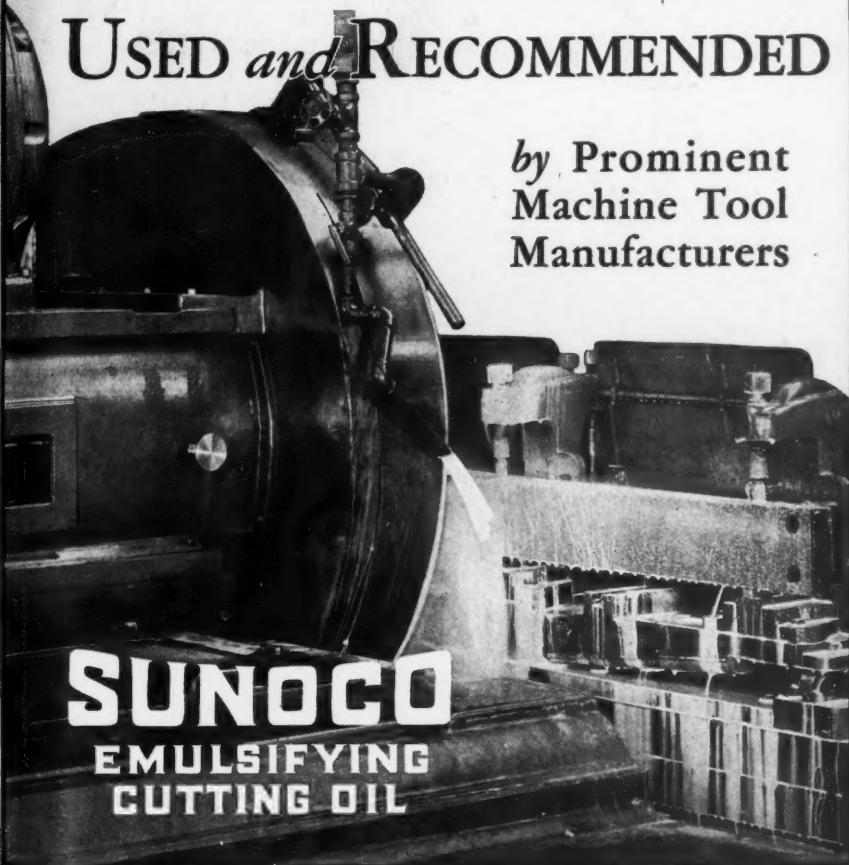
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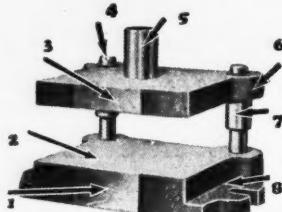


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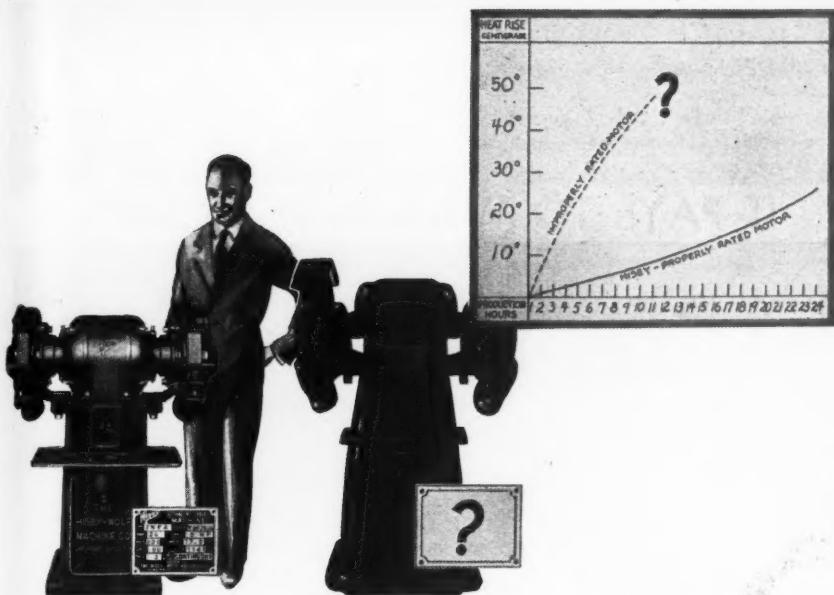
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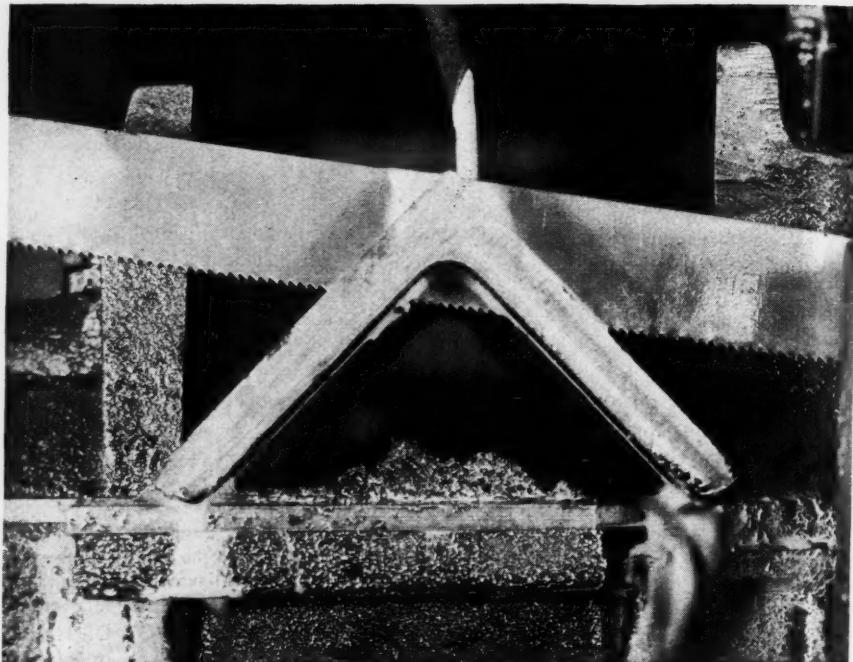


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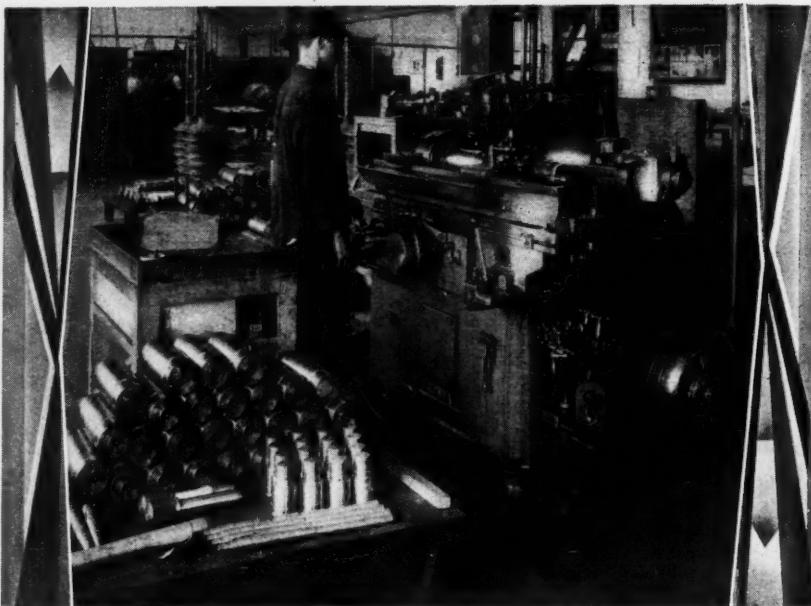
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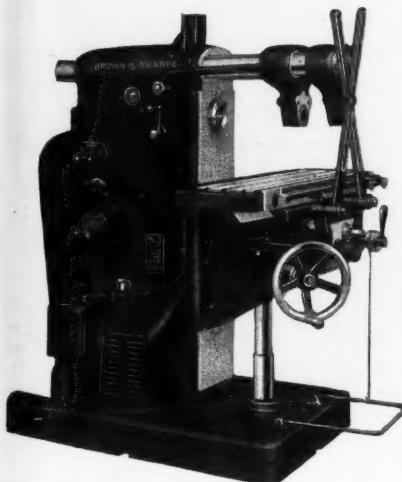
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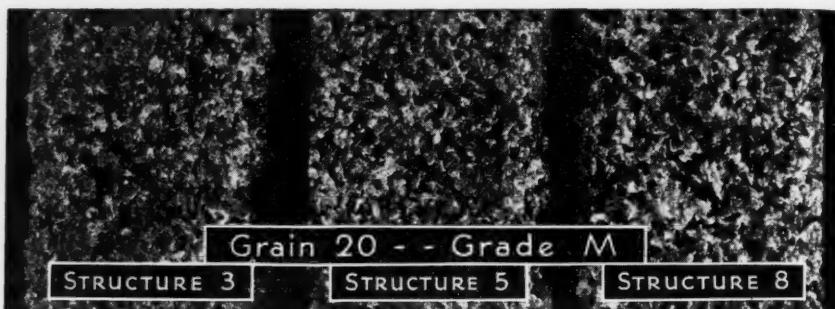


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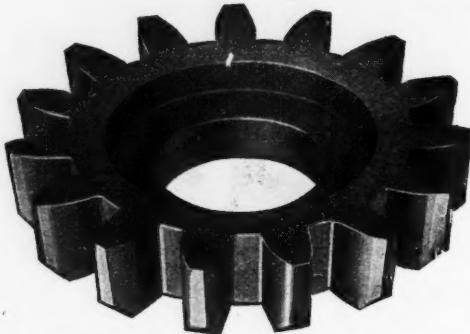
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MODERN Machine Shop

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A Magazine for Machine Shop Executives

HOWARD CAMPBELL, Editor

Vol. 3

NOVEMBER, 1930

No. 6

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MODERN Machine Shop

NOVEMBER, 1930

CINCINNATI, OHIO

VOL. 3, NO. 6



No Dies Too Big For This Shop

By HOWARD CAMPBELL

NO JOB of die-making is too large to be undertaken by the Koestlin Tool and Die Corporation, of Detroit, and this statement applies either to the size of the order or the size of the unit. In 1920 the Koestlin organization occupied the small unit which can be seen at the farther end of the front view of the building shown at the head of this article. In ten years the growth of the business has forced the construction of a building containing 44,000 square feet of floor space—and almost before the building was completed it was again overcrowded.

The steady increase in the amount of business which has come to this plant in the last ten years has been due, undoubtedly, to a policy of specializing on die work which, because of its great size or intricacy, was avoided by other die shops. Automobile manufacture, in particular, has developed a demand for dies large enough to

form a fender or body panel in one piece, and the construction of such dies on an economical basis involves the use of equipment that is comparatively costly. If the equipment cannot be kept busy, the cost increases. The Koestlin Company has seen in this situation an opportunity for service, and the manner in which this firm is filling the need is attested by its fast growth.

The plant is of steel and concrete "daylight" construction and is all on the ground floor, the engineering department alone being located on the second floor of the office section. The plant proper is laid out so that all work of the same class is handled in one department. All small lathes and odd units are segregated in one department, the shapers are located in another, the two 36-in. and one 50-in. openside planers are lined up at the front of the building where there is plenty of room, and the radial drilling

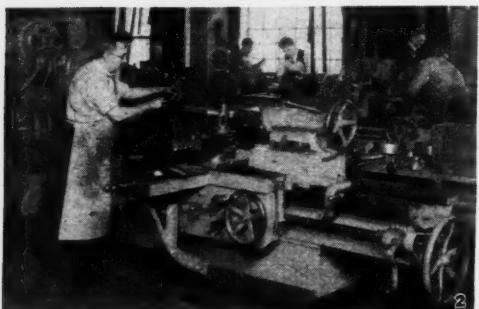


Fig. 2—The lathe department. Work up to 48 inches diameter can be handled in these machines. Fig. 3—These 14 shapers are arranged for most efficient supervision.

machines are placed in a row adjacent to the planers. This arrangement of the radial drilling machines makes it possible to bore two guide pin holes in a die at one time. A

the tool being located at the end of an extension which is long enough to pass through the piece. The panel is a fair sample of the size and type of work for which this shop is especially equipped.

Three of the five large radial drilling machines are shown in operation in Fig. 5, and Fig. 6 shows three of the four Brown & Sharpe vertical milling ma-

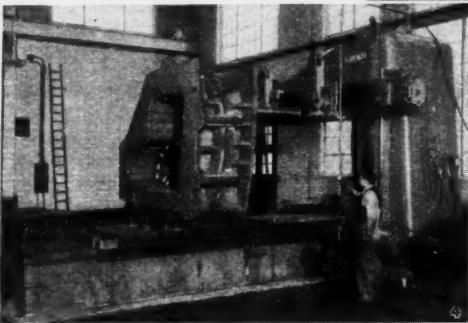


Fig. 4—Machining a die-ring for a coupe body panel. Work up to 78 x 144 in. can be handled on this machine. Fig. 5—Battery of radial drilling machines.

part of the lathe department is shown in Fig. 2 and the shaper department is illustrated in Fig. 3. Figure 4 shows one of the openside planers at work on a die ring for a coupe body panel. The machine is actually performing a horizontal slotting operation,

chines which are used on the smaller work. The illustrations indicated as Figs. 7 and 8 show two sections of the bench and floor department, where the dies are assembled and a large part of the fitting is done. Double benches are used, arranged so as to afford as much room as possible for floor work. An idea of the completeness of

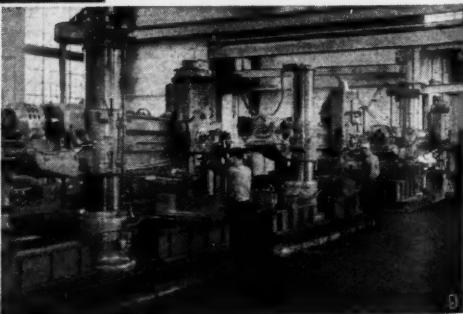


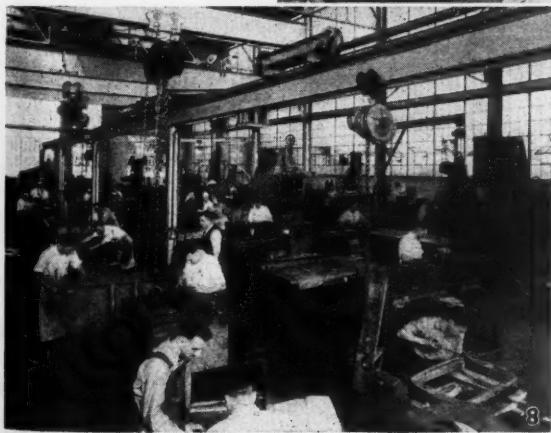


Fig. 6—These B & S vertical milling machines are used on the smaller work. Figs. 7 and 8—Views of the die assembly floor. Note the complete crane equipment, which reduces handling time and keeps costs at a minimum.

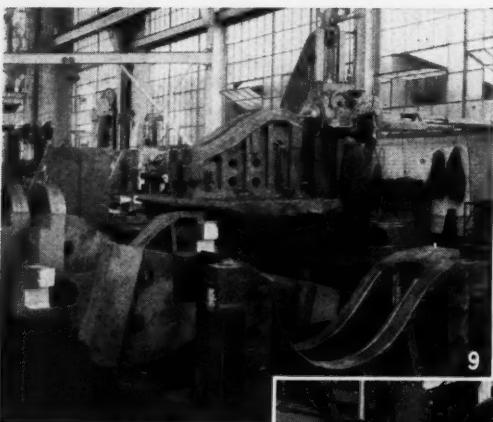
the crane equipment can be gathered from these illustrations.

A 15-ton crane on a runway which extends the entire length of the building provides for handling the extra heavy work and for

transferring heavy die parts from one bay to another. In addition, the heavy machine and floor assembly departments are equipped with hand-operated traveling cranes carrying chain hoists, and the finishing department has 10 air hoists for use in adjusting the dies for grinding and fitting.



At the rear in Fig. 8 can be seen one of the five Giddings & Lewis horizontal boring machines, together with one of the two Keller engraving machines. The horizontal boring machine shown in Fig. 8 can be seen at shorter range in Fig. 9. The job in process is a die for an automobile front fender, upon which the horizontal and vertical surfaces of a shoulder are being milled.



9

Fig. 9—Using a Giddings & Lewis horizontal boring, drilling and milling machine to machine a die for an automobile fender. Fig. 10—These two Keller engraving machines are machining the punch and die for an automobile body main sill. The movement of the tool is governed by the stylus, which follows the contour of the master pattern. Fig. 11—Heat treating department.

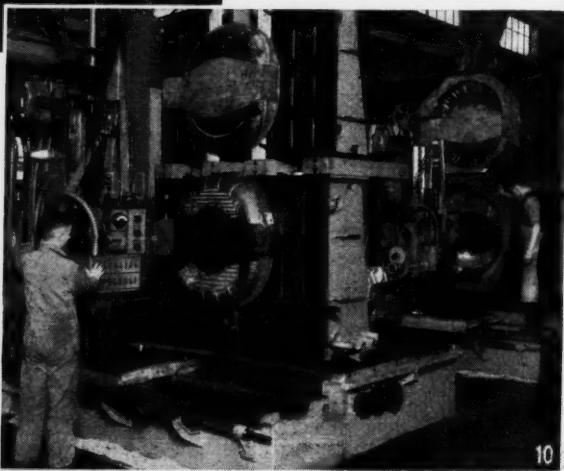


11

Due to their range and adaptability, these five boring machines are continually busy.

The two Keller engraving machines

can be seen in Fig. 10 at work upon a drawing and embossing die for producing two sections of an automobile body main sill. The machine in the foreground is at work upon the punch and the machine at the rear is being used to machine the die. A master model of the piece is set up on the upper faceplate of the machine where it serves as a guide for the stylus which controls the movement of the cutting tool.



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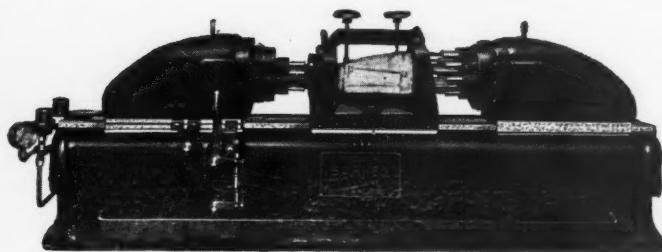
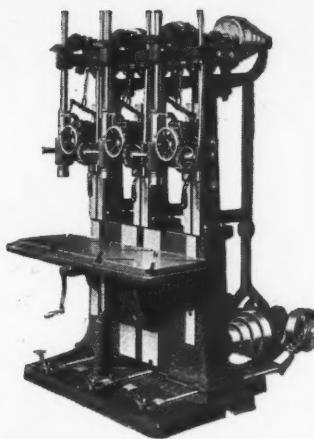
The tool follows exactly the movement of the stylus and cannot be forced out of its position by a heavy cut, although the stylus is easily guided by the pattern. The machine is under full automatic control at all times and any adjustment required is easily obtained.

Not the least important of the plant equipment is that located in the heat treating department shown in Fig. 11. This equipment includes four

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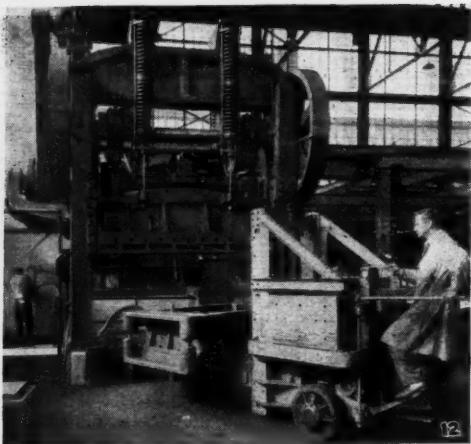


Fig. 12—Each die is tested under actual working conditions before it is released to the customer. This press is one of four installed for this purpose.

gas furnaces, the largest of which is 48 in. wide, 20 in. high, and 60 in. long, one cyanide pot for case hardening, an oil bath for strain drawing, and oil and water vats for hardening. Oil, water or air is used for hardening, according to the requirements of the metal. Each furnace is equipped with a Hoskins Thermo-Electric Pyrometer. Other equipment includes a dry air blower, a forge, and an acetylene cutting and welding outfit.

All models and patterns for the dies built in this shop are also made here, for which a pattern department employing 20 skilled patternmakers is maintained. The time and expense that would otherwise be lost in waiting for patterns or making changes is thus saved, and the facilities for performing all operations incidental to die-building under one roof are completed.

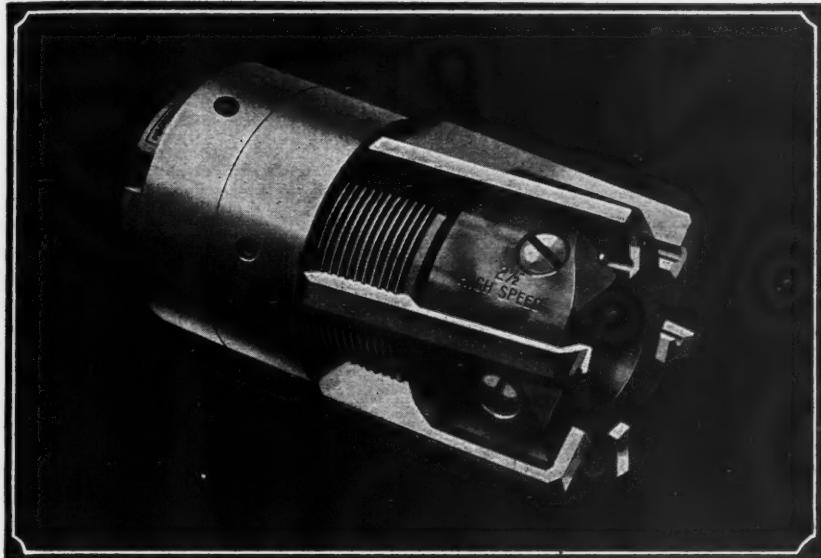
Before a die is released to the customer, it is given a test under actual working conditions in one of the four presses which are used for that purpose. One of the presses—shown in Fig. 12—is a 100 x 48-in. shut height press, completely equipped with air cushions. Another is a double-action toggle press of 500 tons capacity and 60 x 72 x 126-in. opening, large enough to handle the largest dies. This equipment not only makes it possible to give the die a working test, with opportunity to correct any irregularities, but it also provides a finished piece of work which is submitted to the customer for his inspection and approval.

Armco Offers Free Book On Pattern Drafting

Sheet metal shop superintendents, foremen, and sheet metal designers will be interested in a book that has been published by the Sheet Metal Shop Service Bureau of the Armco Distributors Association of America, Middletown, Ohio, entitled "Fundamentals of Pattern Drafting for Sheet Metal Shops."

The book contains 32 pages of 6 x 9-in. size, and the text consists of 12 lessons on sheet metal pattern drafting, beginning with the fundamentals. These lessons were intended to furnish the ground work for pattern drafting, and carry the reader or student consecutively through

the subjects of Parallel Line Development; Joints; Pipes of Same Diameters Intersecting at an Angle; Pipes of Unequal Diameters Intersecting at an Angle; Irregular Intersections Between Pipes of Unequal Diameters; Irregular Intersections of Round and Rectangular Pipe; Roof Flange Fitting Over the Ridge of a Roof; Y Branch, All Pipe of Same Diameter; Square Return Miters; Return Miters Not 90 Degrees; Six Rules for Patterns; Procedure For Drafting; Square and Octagonal Face Miters, and Procedure for Developing Patterns. The book will be sent without charge to metal shop owners or executives. Address Armco Distributors Association of America, Middletown, Ohio.



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Training Foremen At the Olds Motor Works

By DONALD A. CLARK

THE importance of the foreman's position, with its possibilities for waste or savings, for harmony or discord, is finally coming in for recognition. The foreman has been called the "top sergeant of industry," because of the fact that he is the point of contact between the company and its officers and the men who form the manufacturing organization. The matters of what is to be made, how it is to be made, when it is to be made, what it is to be made of, and all the other problems of management may be determined by the officers of the company; the one person who crystallizes the thought of the owners and engineers is the foreman. Upon him hangs the responsibility for producing.

Organization is the keynote of success in modern manufacturing. Efficient leadership is essential, not only in the higher positions, but also in each department of the plant. Industry has been developing at a rapid rate during the past few years—more rapid than in any other period of the world's history. And as the process of development continues, the necessity grows for a higher type of leadership, with a fuller appreciation of the problems involved and a broader knowledge of the principles and methods upon which their solution depends.

There is required at the head of each department a "top sergeant" who can marshall his men and his equipment so as to most effectively produce the quantity and quality of production required; an expert mechanic who knows a good job when he sees it; who

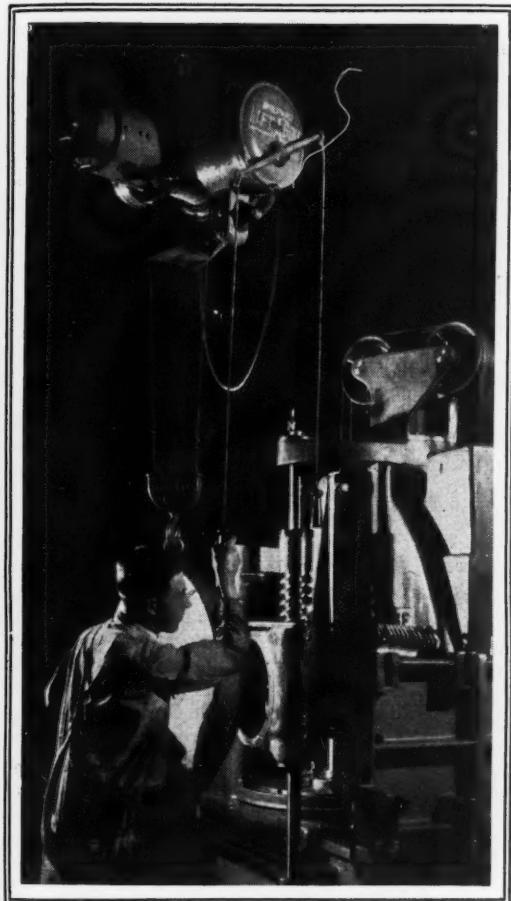
can produce a good job himself and teach his men to do likewise; a diplomat whose relations with the heads of other departments leave no ripples on the surface, and a leader whose dealings with his men are such that they recognize him to be capable and "square." A man who is lacking in any of the qualifications mentioned cannot qualify for foremanship.

The importance of the foreman's job and the need for organized foreman training has been recognized by many industrial leaders during the past few years, including the executives of the General Motors Corporation. In order to coordinate the efforts of the departmental foremen and thus give these men an opportunity to achieve their highest efficiencies, a course in Departmental Management was developed at a conference attended by forty of the key men of the manufacturing divisions of the General Motors Corporation. The first draft of text material was worked out by these men, whose combined experience in practical foremanship, it is conservatively estimated, amounted to at least 400 years.

The educational program as finally worked out consisted of a two-year course which included 40 lessons, or "sessions," each foreman attending two sessions per month. The foremen in each plant were grouped for facility in handling and closer contact, the number of groups depending on the size of the plant. At the Olds Motor Works, the large number of foremen necessitated four groups. Classes were

Accuracy in handling

MULTIPLIES MACHINE PRODUCTION



... Accuracy in handling demands the hoist precisely suited to the job.

WHAT space must be served? How great is the headroom? What is the average load? How many times, how fast and high must the load be lifted? These are some of the questions that must be answered—and the answer satisfied by the hoist which is selected—to provide the maximum economy in handling.

Obviously, a few types and sizes cannot satisfy the great variety of services which modern industry presents. That is why Shepard builds electric hoists in such a comprehensive variety of types, in many capacities, and with the proper control for every need. Unit construction, from standard interchangeable parts, makes every Shepard a performance-proved machine. Shepard's "Balanced" drive invariably functions smoothly—alignment is permanent—control is positive. Automatic oil bath lubrication minimizes wear.

Industry is effecting striking economies through overhead handling, planned with the aid of the Shepard Electric Hoist precisely suited to the service. Some typical results are given in the booklet "Illustrated Economies." Write for a copy!

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CRANE & HOIST DIVISION



THE MOST COMPLETE LINE OF  CRANES & HOISTS IN AMERICA

held from 9:30 to 11 o'clock on Mondays and Tuesdays, one group being called on each of these days. After discussion of the subject accorded for the day, the next week's lesson was given out so that each member of the class might have an opportunity to study it before the class assembled again. The superintendent and division heads served in the capacities of class leaders, and led the discussions.

In the first lesson, which was titled "The Job of Being a Foreman," the requirements for successful foremanship were discussed. It was agreed that, as the lesson indicated, a successful foreman should know:

- a. The nature of the work to be performed.
- b. The tools and equipment with which it is to be done.
- c. How the machinery and equipment should be operated.
- d. How to instruct the men in the operations and supervise their work.
- e. The quality required in the product and how to maintain it.
- f. What the production schedule is and how to get the work out on time.
- g. His personal responsibilities with reference to the job.
- h. The relative importance and the order of these responsibilities. In the second lesson the "Personal Characteristics of the Foreman" were discussed, and the need for tact, initiative, justice, judgment, thoroughness, and loyalty were stressed. The subjects of the remaining sessions, with their keynotes, follow in order:

No. 3—"Modern Organization." Objective of modern organization; Essential requirements; Forms of organization; The foreman's organization.

No. 4—"Essential Requirements of Organization." Strong, resourceful leadership; Clearly defined responsibilities; Carefully selected and placed working force; Standardized methods;

Cost records; Adequate equipment; Cooperation.

No. 5—"The Foreman's Place in the Organization." Representative of management to men and men to management; A balanced relationship.

No. 6—"The Foreman—A Manager of His Department." Principles of leadership; Knowledge of men; Self-control; Recognize, accept and act on good advice; Ability to instruct; Interest in others; Confidence in others.

No. 7—"Need for Analysis of the Foreman's Job." Great variety in foreman's jobs; Methods of analysis; Some divisions of a foreman's job; Partial analysis. In this session it was determined that some of the more important divisions of a foreman's job are (1) Production, (2) Encouragement of a new man; (3) Minimize expenses and costs; (4) Checking up and possible replacement of absentees; (5) Proper handling of new work; (6) Selection of materials; (7) Careful checking of non-productive labor; (8) Elimination of overtime where possible; (9) Upkeep of equipment.

No. 8—"Analysis of Foreman's Job." Responsibilities of the foreman; Detailed analysis. In this session the responsibility of the foreman with reference to the management, the workmen, and the materials and equipment was brought out. It was shown that his responsibility to the management consisted in acting as the representative of the management to the men; developing and maintaining morale; obtaining production; maintaining quality; eliminating scrap and waste; and proper keeping of records and reports. Responsibility to the workmen consists in fitting workers to the job, instructing new workers, maintaining discipline; securing cooperation, maintaining cleanliness and order, securing and use of suggestions, proper rating of workers, helping workers in all possible ways, and representing the men to the management. Responsibility as

FAST and SLOW MOTION

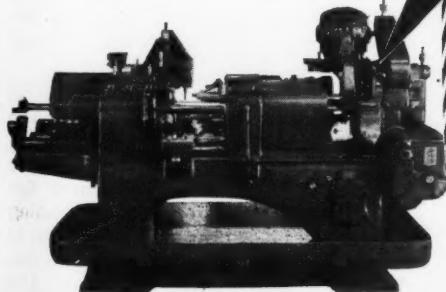
... AND FOR THE MAIN DRIVE, TOO...

The Cleveland Automatic Machine Co. manufacture automatic chucking, forming and screw machines. Control was not the least of the problems confronting their designers. But they found a more than satisfactory solution... Twin Disc Clutches.

In the model M 4 Cleveland spindle bar machine shown, a Twin Disc Clutch is used in the feed bracket to facilitate the machine's fast and slow motion. The fast motion is used in indexing the spindle turret, feeding the stock and advancing the tools to the work. When the tools reach the cutting position, the clutch is shifted to engage the slow motion on the working feed of the tools. And, in addition, the power clutch that drives the entire machine is a Twin Disc Clutch.

More than twelve years of specialization in the

Single "Close Coupled"
Type Twin Disc Clutch,
with compressed asbestos
gear tooth driving plates
used when clutch runs
dry.



designing, building and engineering of clutches... wide and varied experience obtained from direct contact with the machine tool field... and from many standard and special models and sizes developed to meet its latest requirements... have fitted Twin Disc engineers to solve your control problems.

One or more of our stock models may be easily and economically adapted to your special need. Write our Engineering Research Department outlining your requirements. Engineering Data Book gladly mailed on request. *Twin Disc Clutch Company, Racine, Wisconsin.*

TWIN DISC
CLUTCHES

to material and equipment consists in proper selection of material and equipment, proper inspection of work, and maintenance of equipment and tools.

No. 9—"The Foreman's Analysis of His Job." Analysis of job; Illustrative cases.

No. 10—"Fitting Workers to the Job." Wastes of improper fitting; Dealing with new men; Using the man you have; Transfer of misfits; Getting the right man from the employment department.

No. 11—"The Instruction of Workers." Importance of training; Types of training plans; Instructing responsibility of foremen; Principles of instruction.

No. 12—"The Foreman's Job as an Instructor." Relative importance of instructional job; Putting the instructional job across; Analysis of job to be taught; Steps in the process of learning; Items in the instructional process of learning; Items in the instructional process; Instruction a continuous process; Illustrative cases of instruction.

No. 13—"The Classification of Workers." A basis of determining rates, transfers, and promotions.

No. 14—"Principles of Handling Men." Leadership needed in handling men; Know men; Interest in men; Outline of principles.

No. 15—"Discussion of the Principles of Handling Men." Know yourself—control yourself; The foreman must know his men; Know men by name; Types of men; Avoid favoritism; Help the ambitious workman; Give credit where credit is due; The Golden Rule.

No. 16—"Case Applications of Principles of Handling Men."

No. 17—"Maintaining an Efficient Working Force."

No. 18—"Labor Turnover." Cost of labor turnover to the employer; Cost

to the workman; Causes of labor turnover.

No. 19—"Relation of Foreman to the Employment Department." Importance of centralizing employment; Advantages of centralized employment; Need for co-operation.

No. 20—"Methods of Handling Absenteeism and Tardiness." Losses resulting from absenteeism and tardiness. Causes of absenteeism and tardiness. Necessary and unnecessary absenteeism. Methods of handling absenteeism and tardiness.

No. 21—"Developing Understudies." Understudy systems. Importance of understudies. Benefits to the individual understudied. Benefits to the understudy. Benefits to the business as a whole. Methods of selecting and developing understudies.

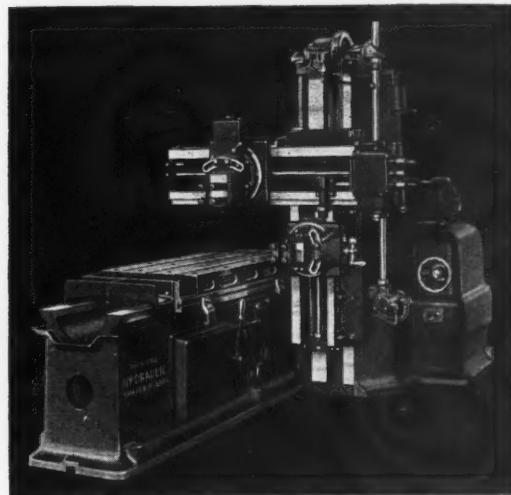
No. 22—"The Foreman's Responsibility for the Maintaining of Quality." Upward trend in quality standards. Nature of quality. Means of maintaining quality (a) through the foreman's supervision; (b) through assistant foreman and gang or group leaders; (c) through the men themselves—a desire for quality; (d) through the inspection department. Quality factors.

No. 23—"The Foreman's Relation to the Reduction of Waste." Wastes in industry. Sources and causes of waste. Relative responsibility. Responsibility of management. Responsibility of labor. Responsibility of the public. The elimination of waste within the plant. Waste within the department.

No. 24—"Means of Elimination of Waste Within the Department." The proper selection of workmen. Proper training for the new man. Proper care and repair of machinery. Proper jigs and fixtures. Scrap due to processing of materials. Scrap due to misuse of tools. Excessive use of expensive materials. Light, power and heat. Unnecessary overtime. Excessive non-

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Why SMALL SHOPS



USE HY-DRAULIC SHAPER-PLANERS

In small shops, or in *any* shop where work is machined in small lots and set-up changes are frequent, Rockford Hy-Draulic Shaper-Planers are used because—

- 1 It is easy to set up work, adjust speeds and select feeds for maximum production on the Hy-Draulic Shaper-Planer.
- 2 The table is always under perfect control. It may be "inched" along with a light touch for quick adjustment of tools.
- 3 The convenient rapid traverses bring tool heads to position quickly.
- 4 A wide variety of work can be handled rapidly.
- 5 This machine has the accuracy of a planer, the speed and easy set-up of a shaper.
- 6 Maximum cutting pressure is reached when the tool enters the metal, and *it remains constant throughout the cut*. Reversals are smooth, quick and shockless. Return stroke is three times cutting speed.

These are some of the reasons why Hy-Draulic Shaper-Planers are a profitable investment for small shops. Plenty of other reasons will be found in the circular which contains complete description and specifications of the Rockford Hy-Draulic Shaper-Planer. Write for a copy—to-day.



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productive labor. Waste due to accidents. Reclaiming of scrap. Relationship of foreman to waste elimination.

No. 25—"The Foreman and Safety." Importance of safety. Relation of workmen to safety. Causes of accidents. Mental attitude. Methods of putting safety across. Legal responsibility of foreman in reporting accidents.

No. 26—"Planning in the Department." Importance of planning. Effects of improper planning on workmen. Steps in planning. Analysis of the job. How planning may help a foreman. Cooperative planning with other executives.

No. 27—"The Foreman's Relation to Company Policies." Reason for company policies. Types of company policies. Carrying out company policies. The foreman's responsibility. Illustrative cases. General policies of the General Motors Corporation.

No. 28—"Industrial Morale." Definition of morale. Industrial unrest. Conditions leading to unrest. Means of overcoming unrest. Factors in industrial morale.

No. 29—"Maintaining Discipline." What is discipline? The place of discipline in management. Causes for external discipline. Methods of obtaining discipline. Discipline should come from within.

No. 30—"Relationship of a Foreman to Suggestions." Suggestion systems. Relationship of management to suggestions. Relationship of the foreman to a suggestion system. Attitude of the men toward a suggestion system. Sustaining interest in suggestions. Publicity. Results of a successful suggestion system.

No. 31—"The Foreman's Relation to Social and Recreational Activities of the Men." Scope of the employees' social activities. Sports. Tendency of modern industrial recreation. The

foreman's relationship to social and recreational activities.

No. 32—"Good Housekeeping." Force of habit. Effect of dirt and disorder. Methods used in good housekeeping. Clean-up plans. Responsibility for cleanliness and order.

No. 33—"System of Wage Payments." The market rate. Principles and methods of wage determination. Economic principles. Viewpoints of employers and employees. True value of wages. Wage systems.

No. 34—"The Foreman's Responsibilities With Reference to Wage Questions." Representative of company in matter of wage policies. Knowledge of wage systems and economics of real wages. Use of records by the foreman in wage questions. Factors influencing the wage that should be paid for a particular job. Other principles of foremanship in wage questions.

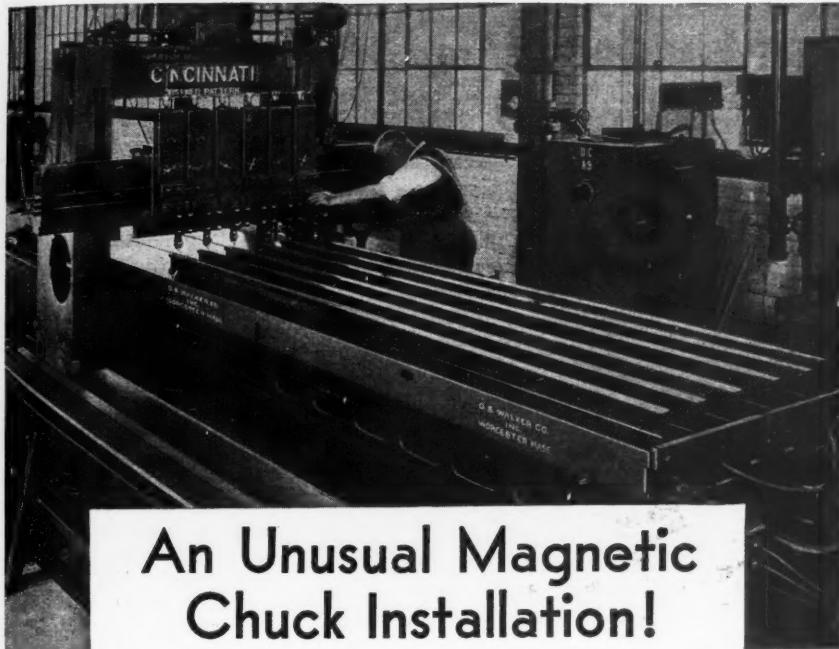
No. 35—"Incentives Other Than Wages." The "will-to-do." Types of non-financial incentives; (a) The creative instinct; (b) Desire for authority; (c) The competitive appeal; (d) Loyalty and pride; (e) Desire for recognition; (f) The preferred occupation or job. Interest in work. Results of non-financial incentives in increase in quality.

No. 36—"Getting Cooperation From the Men." Cooperation defined. Importance of cooperation. Cooperation an individual matter. Means of securing cooperation. Cooperation a mutual proposition.

No. 37—"The Importance of Self-Analysis." Introduction. How and why foremen are selected. Today's opportunities. Self analysis.

No. 38—"Qualifications of a Foreman." List of qualifications. Personality and character. Knowledge of methods. Mechanical skill. Organizing and planning ability. Ability to observe. Resourcefulness. Leadership and executive ability. Instructing

(Continued on page 32)



An Unusual Magnetic Chuck Installation!

Unusual . . . yes, and perhaps difficult for the ordinary type of magnetic chuck . . . but indicative of the ability of WALKER MAGNETIC CHUCKS to handle the unusual jobs.

This WALKER installation is at the Wildman Mfg. Co. of Philadelphia, Pa. . . . builders of knitting machines and allied equipment. Their requirements are stringent . . . often difficult . . . but WALKER MAGNETIC CHUCKS have solved many weighty problems for them. For instance, on the job illustrated the distortionless

grip allows the operator to work to closer limits.

The planer shown is equipped with four 20"x 96" all-steel WALKER CHUCKS, making an installation 40"x 16'. The saving in set-up time alone paid for the installation in a few months.

Engineers who know magnetic chucks say, "WALKER MAGNETIC CHUCKS offer the best way to hold most work, the ONLY way to hold some of it." Let us demonstrate this point with details of other installations . . . write for bulletins.

THE O. S. WALKER COMPANY, Inc.
WORCESTER, MASSACHUSETTS

Manufacturing Operations On Gardner-Denver Equipment

(Concluded)

By PHILIP WINTER

CRANKSHAFTS for the vertical "duplex" or two-cylinder air compressors are machined in the

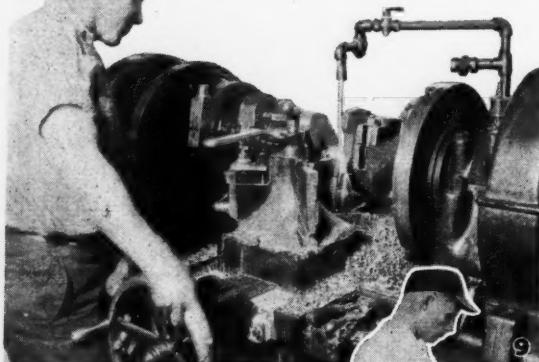
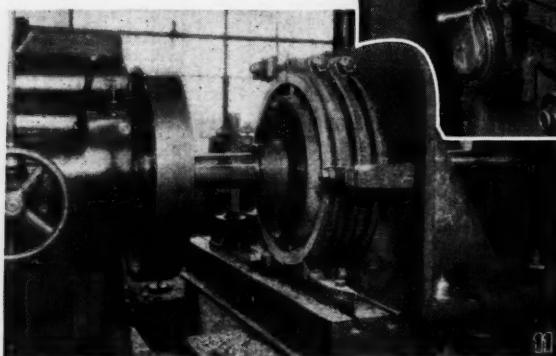


Fig. 9—Machining air compressor crankshafts in a LeBlond Heavy Duty Crankshaft Lathe. Fig. 10—Crankshaft "pins" are ground to size in the Cincinnati Cylindrical Grinder. Fig. 11—Connecting rods for large power pumps are bored and faced on this horizontal boring machine.

LeBlond heavy duty crankshaft lathe shown in operation in Fig. 9. This machine is built especially for machining crankshafts and is equipped with head and tailstock faceplates containing discs to which the crankshaft is bolted. After the machine has once been adjusted, the discs, together with the crankshaft that is bolted to them, can be revolved to bring any one of a set of crankshaft pins in line for machining. Stop pins are provided to obtain accurate settings and to save



time. The toolblock carries three tools—one for machining the "cheeks" of the crank, one for roughing the pins, and the other for finishing the pins. Three shafts per hour are finished

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Announcing...



The SHELDON 11-in. Lathe

*Formerly "Monarch Jr." built by
Monarch Machine Tool Co.*

No longer is it necessary to do the small lathe jobs on large tools . . . not if you have a SHELDON 11" Lathe. This lathe is built to close precision limits and will perform *accurately* the same functions as the larger lathe.

It is furnished in 3-ft., 4-ft. and 5-ft. bed lengths with either full-quick change gear attachment or semi-quick change gear attachment, cone drive or individual motor drive. And, the price is right—see for yourself.

	CONE DRIVE		MOTOR DRIVE*	
	On Bench Legs	On Floor Legs	On Bench Legs	On Floor Legs
11" x 3'	\$325.00	\$330.00	\$405.00	\$410.00
11" x 4'	335.00	340.00	415.00	420.00
11" x 5'	345.00	350.00	425.00	430.00

*Includes $\frac{1}{2}$ H. P. Motor and Starter

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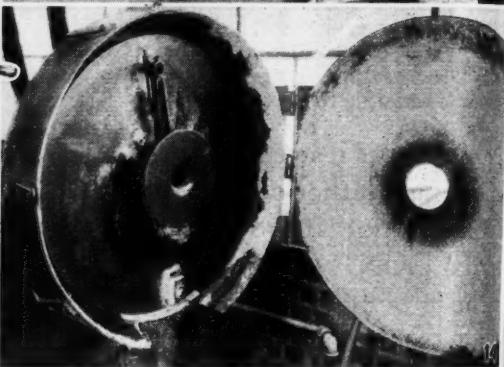
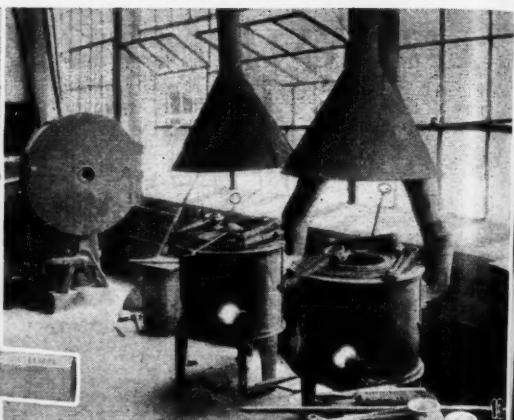
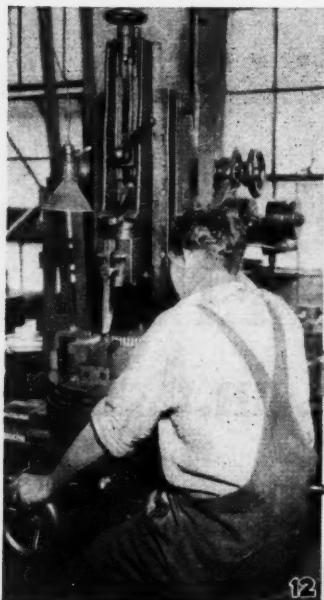


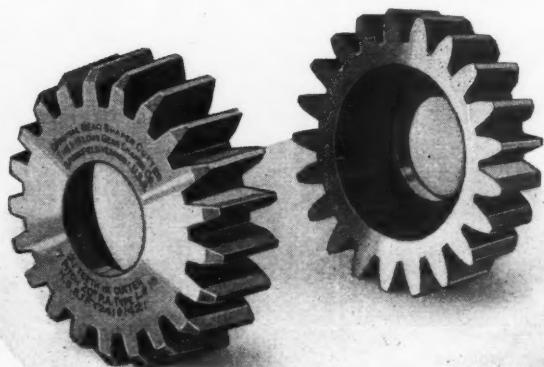
Fig. 12—Slotting out a connecting rod for a horizontal air compressor, using a vertical shaper. Fig. 13—Connecting rods for vertical air compressors are babbitted with this equipment. Fig. 14—View showing a connecting rod in place for babbitting.

with this equipment, within .005 in. of drawing size.

The turning operation is not the final operation on the crankpins, however; the pins are finished by grinding in the Cincinnati grinder shown in Fig. 10. Here the pins are ground to 2.246—2.247 in., and the bearings are ground to the same diameter. Although a variety of work comes to this machine, the time for changing from one set-up to another is reduced to the minimum through centralization of the control levers on the machine. A rheostat at the operator's right hand provides for a variety of work speeds, while the table feeds are controlled by a lever at the operator's left hand.

In Fig. 11 is shown the operation of boring and facing a connecting rod for a large power pump. The rod is clamped to a large face plate and one side of the rod is faced, then it is turned over and reclamped, as shown, and the opposite side is faced and the bearing is bored. The boring operation is performed with two tools in a tool head, as shown in the illustration. The tool head is bolted to the machine spindle, and is supported by a shaft that is inserted in the spindle at one end and is carried in the tailstock at the other. The rod is bored to $23. + .005, -.000$ in. to receive a cast iron sleeve that acts as the bearing.

A different type of connecting rod



There Can Be No Compromise With Accuracy

Irrespective of the number of gears you cut, only those which are sufficiently accurate to use in your product can be counted as profitable. Scrap is a loss and increases the cost of the acceptable gears.

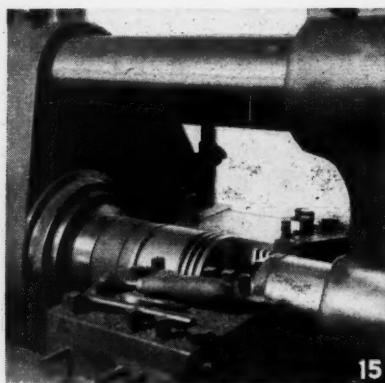
By using only Original Fellows Gear Shaper cutters on your Gear Shapers you are assured of the greatest possible production at the lowest possible cost per gear.

It is a good policy to replace your worn out cutters with Original Fellows Gear Shaper cutters, because by so doing you will lower your costs.

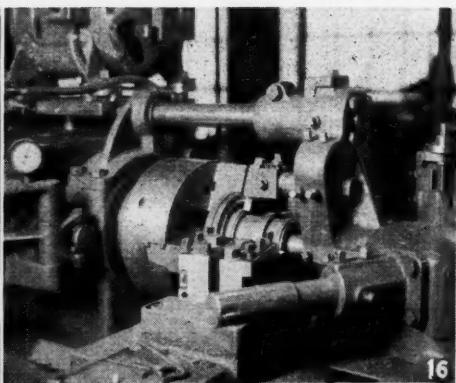
Original Fellows Cutters always make good or we do. Ask for a copy of our Booklet "The Practical Art of Generating"—it is jam full of practical applications of gear jobs.

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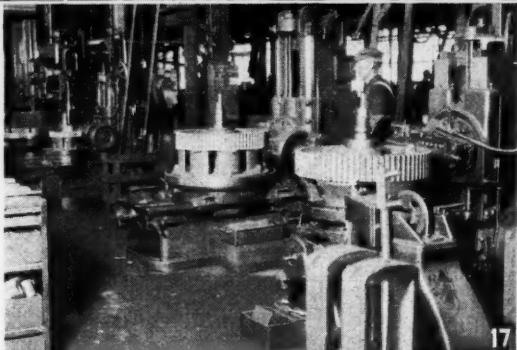
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Fig. 15—Turning cast iron air compressor piston in a Sundstrand "Stub" Lathe. The piston is finish-turned, chamfered, and finish-grooved in 1 min. 15 seconds. Fig. 16—Machining a cast iron bearing plate in a modern-type automatic turret lathe equipped with an air chuck. Fig. 17—View of one section of the gear-cutting department.

is shown in Fig. 12, in process of having the crosshead slotted out in a Pratt & Whitney vertical shaper. This rod is for use in the horizontal air compressor.

The stock in both ends of the rod is removed by drilling a series of holes so that the center can be removed in a solid block. This leaves approximately $\frac{1}{8}$ in. of stock on a side, all but .004 or .005 in. of which is removed in the roughing cut shown in process in the illustration. The last .005 in. is removed in the finishing cut. The large end of the rod is finished to 5.250×7.875 in., with a tolerance of $-.002$ on the small dimension and $-.010$ in. on the large dimension. The small end is finished to 4.000×5.875 with tolerances of $+.002$ in. on the smaller dimension and $-.010$ in. on the larger. One of these rods is finished—both ends—in five hours.

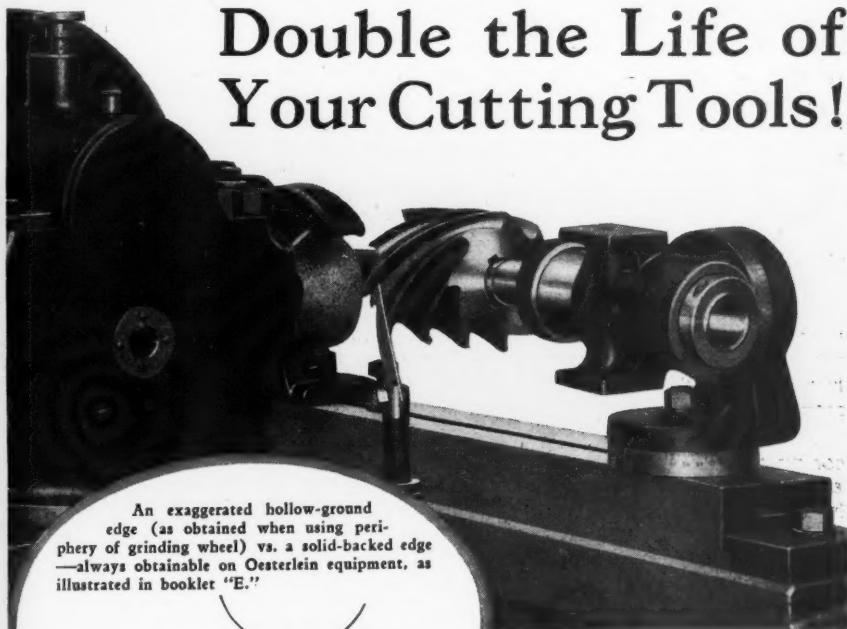
In Fig. 13 is shown the equipment with which the connecting rods for the



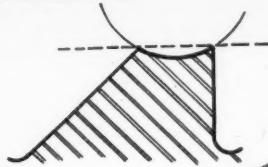
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vertical air compressors are babbitted. Two oil-burning furnaces containing lead pots provide facilities for melting the babbitt metal. The bearings are cast in the rods by the centrifugal process, using the machine shown in the background. This machine, which is shown again in Fig. 14, consists for the most part of a disc grinder to which a special fixture and the necessary guards have been applied. The disc is of steel, $\frac{3}{4}$ in. thick by 30 in. diameter, belted to run at a speed of from 650 to 700 r. p. m. A small circular plate with a hole through the center is supported by three studs at the center of the disc, just enough clearance being provided between the plate and the disc wheel so that the large end of a connecting rod can be

Double the Life of Your Cutting Tools!



An exaggerated hollow-ground edge (as obtained when using periphery of grinding wheel) vs. a solid-backed edge—always obtainable on Oesterlein equipment, as illustrated in booklet "E."



Above—Coarse Tooth Spiral Mill set-up with underslung tooth rest. Left—Illustrating the difference between Oesterlein method and other methods of grinding.

KEPPING your cutting tools in service twice as long is only a matter of proper grinding.

Oesterlein Grinders properly grind cutting tools through the use of a cup-shaped wheel, which grinds a straight-line clearance that results in a solid-backed cutting edge. Such an edge lasts much longer than an undercut edge.

An outstanding feature of this machine is the ease with which the cup-shaped wheel may be applied to any type of cutting tool.

Rigid construction—all bearings and wearing surfaces protected from dust—automatic lubrication—dual control—two rates of table traverse—quick set-up on all types of cutters—these are a few of the features which make the Oesterlein Grinder the ideal grinder for your tool room.

Our new illustrated booklet is yours for the asking.

**MAIL COUPON
TODAY!**

THE OESTERLEIN MACHINE CO., Cincinnati, O.
Please send me one of your new illustrated
grinder booklets.
Name _____
Firm _____
Address _____
City _____
State _____

OESTERLEIN
OHIO
MILLING DRILLING EQUIPMENT

inserted. The rod is located and clamped by means of a stud, which is entered into the hole in the small end of the rod, and screws in each of two lugs attached to the disc underneath the plate. When the rod is clamped in position, the hinged door to the guard is closed, the disc is started revolving and a ladleful of molten babbitt is poured through the opening in the plate into the rod bearing. The centrifugal motion of the disc throws the liquid metal against the wall of the bearing, building up a solid layer of babbitt. The babbitt solidifies almost immediately, after which the rod is removed and the operation is repeated.

Pistons for the smaller types of compressors and pumps are turned in a Sundstrand "stub" lathe, as shown in Fig. 15. The operation shown is that of finish turning, for which a turning tool, a chamfering tool, and four grooving tools are required. All tools are of Carboloy. The turning tool is held in the front tool-block and the chamfering and grooving tools are held in the rear block. The ring grooves are machined to a width of .250-.2515 in., and the piston is turn-

ed to a diameter of 5.000, plus from .008 to .010 in. which is left for the grinder. The finish turning and grooving operation is completed in one minute and fifteen seconds.

The operation shown in process in Fig. 16 is that of turning, facing and boring a cast iron bearing plate for a power pump. The machine is a motor-driven automatic turret lathe, equipped with a Logan air chuck, and the tools are of Carboloy. In this operation the piece is rough and finish turned to a diameter of 4.625 in. with a tolerance of —.002 in., the front and back faces are finished to a .002 in. limit, and the piece is bored to 2.754 — 2.755 in., all of which is completed in 13 minutes. As the operation of the machine is automatic, the operator is easily able to operate two machines on this operation.

A part of the gear-cutting department is shown in Fig. 17, where three hobbing machines can be seen in process of hobbing semi-steel spur gears for use in the larger sizes of power pump. The gears are 30 in. P. D., $5\frac{1}{2}$ in. wide, and have 75 teeth of 2.5/3 D. P., which is a "stub" tooth of extraordinary strength.

Training Foremen at Olds

(Continued from page 24)

ability. Physical energy—"pep." Attitude toward job. Ability to co-operate.

No. 39—Personal Analysis.

No. 40—"Opportunities for Leadership and Industrial Development." The development of men. Helping men to think straight. Returns to industry. Returns to foremen. Conclusion.

In the final analysis, the results that have been obtained through the course of training outlined have been that the foremen have become department managers instead of super-workmen; the department foreman has developed an organization spirit that in too many cases was lacking before; he

has developed a more fitting appreciation of the relationship he bears, in his official capacity, to the rest of the organization; and what is more important, the minds of all the foremen are trained so that they think toward a common objective. The foreman is also closer to his men; his definite ideas as to policy and the manner in which the important matters of his department should be handled give him a prestige which is lacking in the case of the foreman whose ideas as to policy are as yet uncrystallized, yet the respect that his men are forced to accord him brings them closer to him and is, as a result, productive of more and better work suggestions, and other varieties of cooperation.

Our Dumores Have Paid for Themselves Many Times Over

.... a statement from the plant of the Oberg Brothers

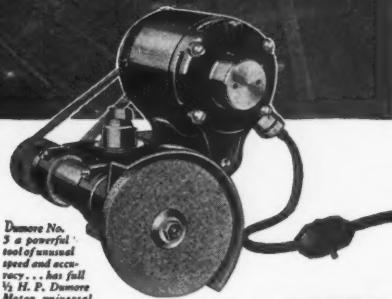


THREE years ago, Oberg Brothers bought a No. 3 Dumore. The splendid performance of this grinder caused the selection of a No. 5 Dumore, when additional equipment was required last year. The smallest hole previously ground with other machines was 12/100 of an inch. The Dumores now permit Oberg Brothers to grind holes ranging from 70/1000 of an inch to 1/2 inch, with a maximum depth of 2 inches. No tolerances are allowed on many jobs, but the Dumores achieve these specifications with absolute accuracy. They produce a glass-like finish that eliminates the difficult and profit-losing lapping operation.

Today Oberg Brothers say: "Both Dumores have paid for themselves many times over in low production loss, and we depend upon them implicitly."

Send the coupon for Dumore details.

THE DUMORE COMPANY
28 Sixteenth Street
Racine, Wisconsin



Dumore No. 5 a powerful tool of unusual speed and accuracy. It is built to full $\frac{1}{2}$ H. P. Dumore Motor universal type . . . automatic oiling system . . . fan keeps the motor "cool" at all speeds . . . aluminum housing for light weight . . . variable speeds . . . four quills . . . four periphery . . . automatic belt tensioner . . . precision002" . . . spindle speeds of 3,600 to 35,000 R.P.M.

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28 Sixteenth Street, Racine, Wis.
Please send details of the New No. 5 Dumore together with a free copy of "Precision Grinding".

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TRADE MARK

DUMORE HIGH-SPEED GRINDERS

REG. U. S. PAT. OFFICE

A Perpetual Inventory System

By WALDO HUTCHINSON

THE close of the year is usually a source of worry to the manager on whose shoulders falls the responsibility for taking inventory. How to do it quickly and accurately and, at the same time, avoid interrupting the plant routine, is a problem that confronts every manager. Consequently a discussion of a system that obviates this worry should be of interest. This system, which is in operation in the plant of the Wyner Machine Works, not only permits the inventory to be taken easily and economically, but also provides a perpetual inventory with which to guard against shortages.

More than 10,000 items are carried on the books. Inventory is taken once each year, beginning in January. Notwithstanding the great number of items carried and the necessity of counting all stock by hand to show the amount on hand at the first of the year, the stock-taking is done without upsetting the daily routine in the least.

In the first place, each floor of the stockroom is laid out in a manner that facilitates the rapid handling of materials and the filling of orders. Each floor is numbered and each section is lettered, the bins and racks being given consecutive numbers. A location indicated as "2A-14", for instance, would be Section A, second floor, Bin 14. Like goods are assembled according to sizes, so that even a new man could find any desired stock without delay. As a further aid, each bin or

The system outlined here enables the Wyner Machine Works to keep a continuous record of stock, thus avoiding the expense, time and trouble of periodical inventory taking.

rack is labeled with the name and size of the parts contained in it. If at any time a bin is overtaxed, the surplus is stored elsewhere and a record is made on a card which is attached to the bin. This systematic stock arrangement is especially valuable at inventory time.

The stock-records are kept up to date by means of a special loose-leaf inventory book (Form I) in which are listed all of the items that appeared on the last stock list.

The leaves are arranged numerically to correspond with the consecutive numbers on the bins, the bin numbers to be found on that sheet being in the upper right-hand corner. The floor and section are also indicated. In this case the book is also cross-indexed under the names of the goods.

For the perpetual stockkeeping inventory system, cards (Form II) are used, arranged alphabetically according to the names of the goods. This is the cross index for the inventory book. These cards are used in conjunction with tags (Form III) for tabulating the stock. When it is time to take the inventory, the person in charge of the work brings these tags into use. He is provided with assistants whose main qualifications are care and accuracy in counting. In this factory, the work is turned over to intelligent workmen, so that it is not necessary to keep high-salaried employees from their work.

As the stock is counted and the re-

They must be right

- in design
- in workmanship
- in performance

Guide Lamp Co. use 138

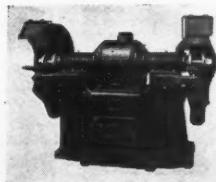
HAMMOND Polishers in their Anderson plant. (This is but one of many similar large installations.) Satisfaction with first and each succeeding purchase only prompts such favor. They must be right in design, workmanship and service rendered.

COMPARE

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for Catalog 20—
you'll find it
interesting.

Hammond
Machinery Builders
INCORPORATED

1622 Douglas Ave.
Kalamazoo, Mich.



November, 1930

sults noted on temporary cards, the stockkeeper in charge closely checks these figures and enters them on the tags, which, of course, are arranged

any errors in the records are prevented.

This system provides a continuous record of goods and goods taken from

Date.....

Bin Nos.....

Floor	Sec.	Bin No.	Article	Size	Price	Disc.	Net

Form I—A sheet from the loose-leaf inventory book. The book contains sheets for all the items appearing on the stock list, arranged according to bin numbers.

numerically in bundles according to sections. Each tag or ticket is carefully matched with the bin counted. The count is placed under the heading on the tag shown as Form III, in the "Amt. In" column.

If there is any discrepancy in the number counted and the number that should be in the bin, it is reported to the office for adjustment. In this way,

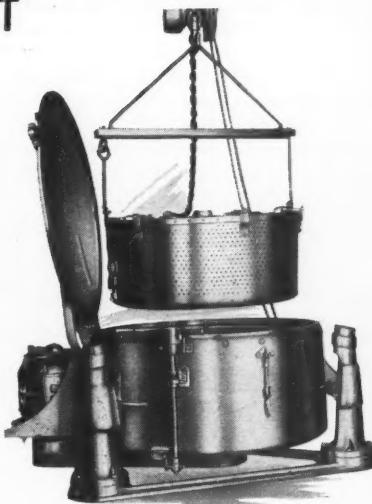
the bins, for the tags are carefully kept, and "Ins" and "Outs" are registered whenever pieces are put in or taken out. By this simple method, the entire count is taken in two weeks without delaying the business in any way. Each tag is kept in a convenient little rack or pocket at the bin. At the end of the year, before the new count is started, all the tickets are collected

Form II—Perpetual inventory card. These cards are arranged alphabetically according to the names of the parts and serve as a cross-index to the inventory book.

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In one large machine shop, a single Tolhurst Center-Slung Chip Wringer, with a single operator, handles the entire chip output of 40 tons a week. Chips leave the Tolhurst dry—with a high market value. And the shop has used the same cutting oil for over three months, with no additions. Here is real cutting oil economy. This shop is getting all the profit from its oily chips. Your shop can do the same.

Tolhurst Chip Wringers are available in two types, in many sizes, all equally efficient, all requiring little labor. Let us show you how Tolhurst will put your



oil recovery methods on a basis that will pay you the highest possible profit. The coupon will bring the facts, without the slightest obligation.

TOLHURST Chip Wringers

TOLHURST MACHINE WORKS, Inc.,
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Gentlemen: Please give me the facts on Tolhurst Chip Wringers. We handle about pounds of chips a day. The material is We prefer (line shaft) (individual) drive.

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COMPANY ADDRESS

from the bins and the amounts on hand are transferred to the new inventory book for the ensuing year. This method of taking inventory is comparatively simple and any number of persons are thus permitted to work on the task at one time. On the inventory book, columns are provided for the extensions, price and dis-

new stock that is received is entered on the cards under the heading "Amount Received," and, as charges on orders come through, all outgoing stock is entered under "Amount Delivered." The balance is shown under the heading "Amount on Hand." Thus the amount of any particular stock on hand can be determined at a glance.

Form III—Tag on which continuous stock-record is kept. Each entry and withdrawal is noted and the balance shown.

counts, making the records complete.

The inventory cards, which are kept for a cross index and permanent record, form a double check to prevent any neglect in making the proper entry on the tags. The card system makes it certain that all orders will be filled promptly, because it prevents letting the stock get too low. The records are kept in the office and are cared for accurately, as they act as a check not only on the tags in the bins but also on the inventory sheets. All

also a valuable aid to the promise department. When an order is received and resolved into its component parts, a clerk can go over the file and determine whether or not there is sufficient stock on hand to fill it, and then submit a report upon which the promise to the customer is based.

Many factories and stores practically have to shut down while inventory is taken. Work is interrupted, promises to customers broken, and machin-

(Continued on page 116)



To Increase
Production Put a
CANEDY-OTTO
On the Job

THE minute you put a C-O Drill on your work — your production increases. It increases because the ample protection of all moving parts, plus a well-balanced design, allows these drills to run at higher speeds.

Take, for instance, this C-O 15-inch high speed bench drill. It can safely run at 10,000 r.p.m.

Less power is required for the operation of C-O Drills because the vertical mounting of

the motor eliminates idlers, pulleys and all twists and turns in belts.

The drill is furnished complete ready for operation by attaching to a lamp socket—another Canedy-Otto cost-reducing feature—and is ball bearing-equipped throughout.

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Modern Tooling Practice, VIII

By FRANK W. CURTIS

FIXTURES for operations other than drilling and milling are built more or less according to the methods that have been described. Facilities for locating and clamping are the outstanding requirements, and the numerous design features previously illustrated can be applied either directly or with slight modifications.

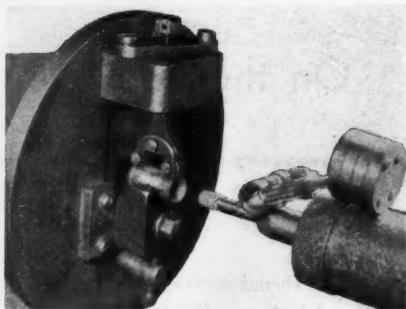


Fig. 57—Fixture holding air motor piston assembly for internal grinding.

Fixtures of various forms are used extensively for production grinding operations. As in the design of fixtures for other operations, it is necessary that the work be held rigidly so that no vibration can take place. On cylindrical work it is necessary to balance the rotating members, which include the work and whatever type of fixture is to be used, because any unbalance is apt to set up vibration that will make it impossible to produce a smooth finish. It must always be remembered that abrasive dust will cause rapid wear on any moving parts, and it is therefore well to provide

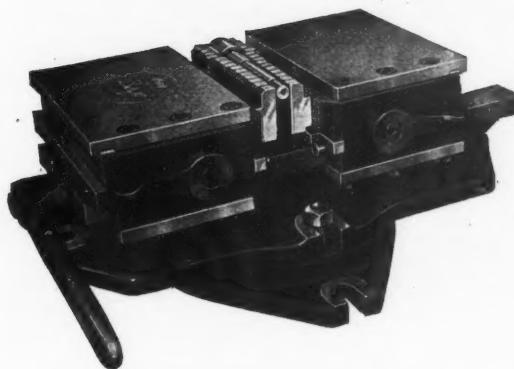
hardened and ground wearing plates wherever possible.

A typical type of fixture used with an internal grinder is illustrated in Figure 57. The work-piece is a piston assembly for an air motor and includes a built-up type of connecting rod and pin bushing. The workpiece is located in a central position by means of a V-block, attached directly to the faceplate fixture, whereas the piston is located by a block arranged with a swinging-type clamp, as shown. Usually a very small amount of metal is removed during a grinding operation of this kind, and the fixture must be designed so that accuracy in locating and clamping can be obtained. Any slight variation is quite likely to throw the work off center, with the result that the hole may not "clean up."

In Fig. 58 is illustrated a disk-grinding operation, the machine being equipped with a rotating worktable that is provided with four fixtures, each of which differs so that four distinct operations are produced at each rotation of the fixture assembly. In brief, the set up is arranged to face-grind two surfaces of two different parts. The work, in all cases, is drawn vertically against locating stops by means of hook bolts. Grinding operations of this kind offer wise possibilities, but much depends upon the efficiency of the fixture design.

Another form of face-grinding fixture is illustrated in Fig. 59, the work-piece in this case being an automotive connecting rod which is to be rough-

It's
Easy
With a **BERJO VISE**



HOLDING odd shaped pieces of work is an easy job with a BERJO VISE. It holds any shape . . . no matter how irregular . . . with a grip like a giant.

The BERJO VISE is built on a new principle . . . radically different, yet extremely simple. Its jaws are made up of sliding steel segments, backed up with steel balls which instantly shift position when pressure is applied to the vise, allowing the jaws to conform to the contour of the work.

Thus, on your drill press, milling machine or shaper . . . when you have a small job calling for twenty-five, fifty, or a hundred pieces . . . you don't need to make a special jig. Just use the BERJO VISE . . . it will hold your work without danger of slipping.

Get acquainted with the BERJO now. Send the coupon for illustrated bulletins . . . they'll show you what this vise will do in your shop.

THE AVEY DRILLING MACHINE CO.

CINCINNATI
OHIO

THE AVEY DRILLING MACHINE CO.
Cincinnati, Ohio

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Firm

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ground on both sides. Four pieces are held at a time by the fixture shown, the rods being in the rough-forged condition without having any previous operation performed. The method of holding each pair of rods differs somewhat, due to the direction of the

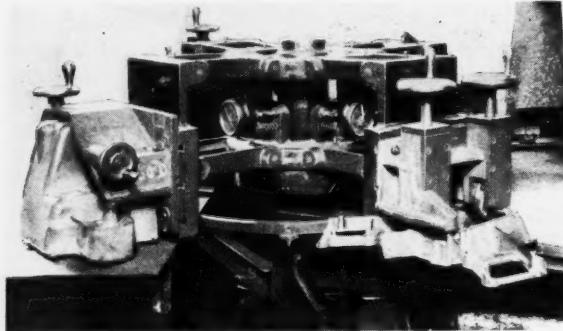


Fig. 58—Four fixtures on this disk grinder provide for four distinct operations at each revolution of the table.

wheel. It is necessary, of course, to back up or support the work in the direction of the cut. The rods at the left end are located by V-blocks that support the large end. The opposite ends of this pair of rods are held by an eccentric clamp that is operated by the handle shown at the rear of the fixture at the right-hand side. The other pair of rods is located by V-blocks that centralize the wrist-pin end, the opposite end being located by means of a hardened steel block with angular faces, as shown. The feature of the fixture is that all four rods are clamped by a single motion of the eccentric clamping handle. The rods at the right-hand end are placed in first, then when the other rods are in position the clamping handle is turned, the eccentric clamps forcing the wrist pin bosses of the second pair of rods against the webbed sections of the first pair. At the left-hand end of the fixture is shown a built-in attachment for dressing the face of the abrasive wheel used for this operation. The

fixture is mounted in a slide that oscillates in front of the wheel and when the dresser is applied, it is adjusted to suit and oscillated accordingly, although there are no connecting rods in the fixture when dressing is done.

In Fig. 60 is shown a fixture used for the disk grinding of small rectangular pieces. Work ranging from $\frac{3}{8}$ in. to $1\frac{1}{2}$ in. in width can be accommodated in this fixture. The pieces are placed one at a time in a slot of the fixture that extends slightly off center over the abrasive disk. After placing the work in the fixture, the operator pushes it onto the abrasive disk by means of the lever at the front end. As the second piece is fed through, it pushes the first piece farther along, the operation being continued until the fixture is filled. The work is ejected at the opposite end. A number of adjustable spring plungers are located

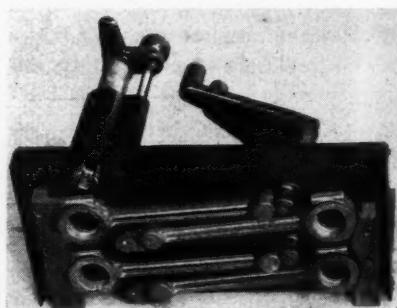
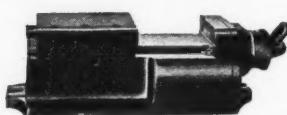
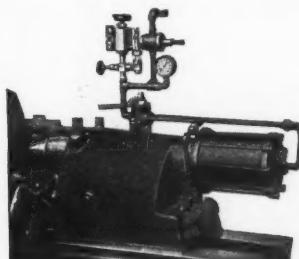


Fig. 59—Fixture to hold four connecting rods for grinding.

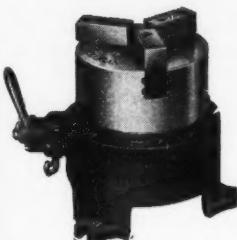
in the upper portion of the fixture as shown, in order to supply downward pressure to hold the work against the wheel. The work is ground wet, water being supplied to the center of the fixture by a motor-driven pump mounted



Milling Machine Vise



Tailstock Device



Drill Press Chucking Device



Assembly Vise



Arbor Press

SECONDS >>> >>> Instead of Minutes!

Here are several LOGAN Air Operated Devices which perform the particular operation for which they are intended in SECONDS instead of Minutes.

Take for instance the drill press chuck, or the several models of vises. All that is necessary is to place the work between the jaws, operate the control lever, and the work is held immovable, without chance of slipping.

The tailstock center device provides a means for instantly moving the center to and from the work. There is no lost time or motion.

LOGAN Arbor presses combine sufficient power for practically any arbor press job, with a fast ram movement which gets the job finished quickly.

There's a LOGAN Device for every requirement! Catalog S-25 describes them all. Get your copy today!

THE LOGANSPORT MACHINE CO.

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INDIANA



Fig. 60—Small rectangular pieces are disk ground in this fixture.

in the base of the machine. The size of the workpiece shown, $\frac{1}{2}$ in. square \times 4 in. long, is ground at the rate of 2,000 sides per hour. As the four sides are finished, a production of 500 pieces per hour is obtained.

Vise-Jaw Fixtures

The conventional type of vise offers great possibilities in connection with the manufacture of small interchangeable parts. There are a great many methods of applying a vise for a given piece of work and operation, some of which are shown.

At A in Fig. 61, is shown a type of vise in common use, having a range between jaws of from 0 to 4 inches. To use a vise in connection with production work, it is only necessary to have a movable and a stationary jaw, to be provided, of course, with the necessary locating and clamping facilities. At W is shown a standard form of jaws applicable to this

type of vise. If vise-jaw fixtures are to be used extensively, it will be well to standardize on one type of vise, and then make a jig for drilling and tapping the holes in the jaws by which they are to be held in place.

Round and square work offer the simplest means of holding, and at B is shown a method of holding a bar by utilizing a V-block jaw on one side and a plain jaw on the other. The example shown at C is somewhat similar, although the V-block is of different design. Still another method of holding round work is shown at D, the jaw at the left-hand side being made with a slight angle so that the work is forced into and held in place when the jaws are closed. Sometimes it is necessary to have these jaws extend above the top face of the vise, in which case it will be well to provide guide pins as

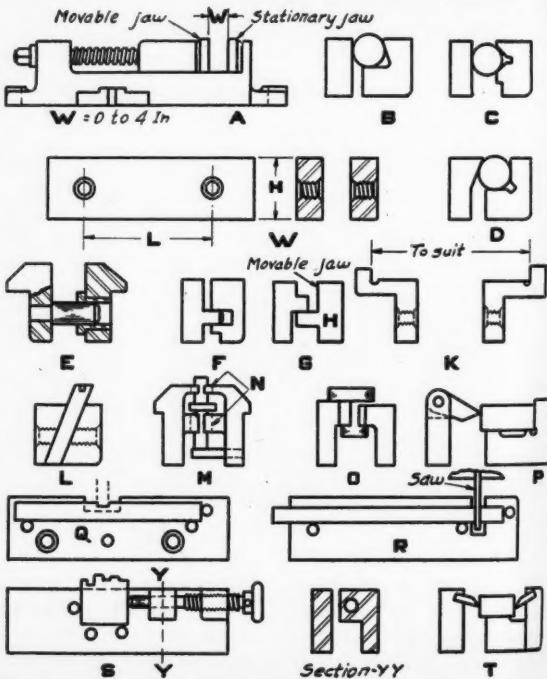


Fig. 61—Various types of vise-jaws used to locate and hold work.

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UNBREAKABLE

Base of steel, not cast iron. Strong, rigid, unbreakable.

ADJUSTABLE

Adjustable in height or slant. Has the new spiral-shaft-lever movement. Adaptable to vertical drafting.

COMFORTABLE

Note the large foot-board.

SAFE

Top cannot drop down accidentally. The hand wheel on side must be turned.

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shown at E. The pins are mounted on the movable jaw and bushings are provided in the stationary jaw. Pins of this type provide a rigid construction. Again, it will be well to provide a jig for the location of these holes and to standardize their center distances, as well as to aid in replacement of any parts that become worn.

Another method of stiffening a pair of vise-jaws is illustrated at Fig. F, in which the movable jaw is made with a tongue that fits into a slot machined in the stationary jaw. At G is shown a method of preventing the movable jaw from rising under pressure, which is very often the case. The movable jaw H is made with a tongue that fits under a projection located on the stationary jaw. When a piece of work wider than the maximum opening of the jaws is to be held, it is possible with jaws such as those shown at K. Angular work can be held as shown at L, by making the locating faces of both jaws to suit the angle required. At M is shown a method of holding a cylindrical piece in a vertical position, using the set of V-blocks indicated at N. The work in this case is a small screw machine part, which is located vertically by means of a stop pin mounted in the stationary jaw. Another method of holding a round part vertically is illustrated at O. In this case, the work is located by means of a shoulder that strikes the V-block section of the stationary jaw. The example at P shows a hinged

hold-down used in clamping flat work.

At Q is illustrated a pair of vise jaws for holding a square piece for the milling of a slot. In this case locating pins are used for positioning the work. Another similar use for pins is shown at R, the operation consisting of cutting small blocks from a bar.

Clamps are often used to locate a

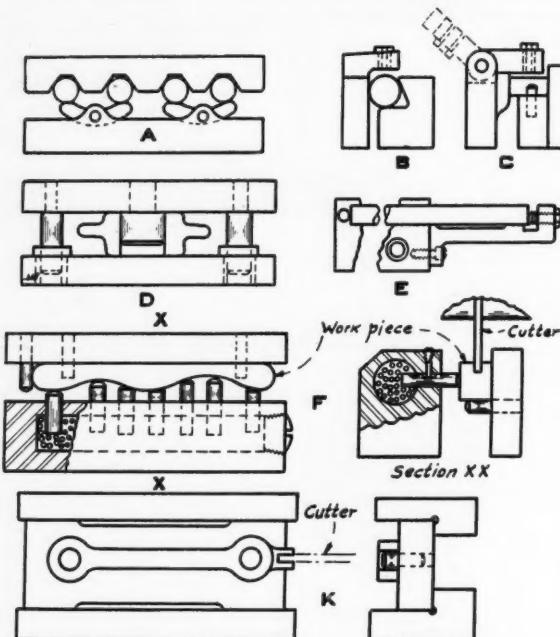


Fig. 62—Fixtures used with vises

workpiece between jaws, and at S is shown a method of holding a piece in the stationary jaw by means of a screw. Hold-downs similar to those used in the shaper or on the planer can be applied to vise-jaws as shown at T, in which case the hold-downs are made as an integral part of the jaws.

In Fig. 62 is shown a variety of vise-jaw fixtures, the example A showing a method of holding four round pieces at one time by means of two swivel clamps located in the movable

ON ALL FOURS

Hitch a racer with a draft horse and you get a team that can neither make fast time nor pull a load.

It is just so with a brand new machine on which an old chuck is applied.

Just as there has been a marked advancement in machine designs giving higher speeds and feeds, so has there been a vast improvement in chuck design giving greater speed of operation; a more rigid, more accurate alignment to work and tools, as well as making heavier cuts available.

To use an old chuck on a new machine is a mechanical injustice. After all it's the chuck which holds the work or tool. The chuck is of vital importance; it is the essential element in the operation of the machine.

Look over your chucks and replace the old ones with new models. The investment in new chucks is far less than the labor costs with old equipment.

There is a new chuck for every mechanical purpose. Your dealer has a man who knows about these new mechanical features.

The CHUCK MANUFACTURERS of AMERICA

jaw. At **B** is shown a method of mounting a drill bushing on a vise-jaw, while at **C** is shown a hinged-type bushing plate mounted on the movable jaw. In the latter case the piece can be removed quickly, inasmuch as it is necessary to barely loosen the jaw in order to remove the piece. The example **D** shows a method of locating the workpiece by slipping it over a plug attached to the stationary jaw. Sometimes the workpiece is longer than the width of the jaws, in which case it is possible to provide an extension support, something like the support illustrated at **E**.

In holding irregular-shaped work, it is possible to provide a design, such

as shown at **F**, in which the movable jaw is provided with a number of locating pins. The opposite ends of the pins project into an opening filled with wax or small shot, the opening being closed by a setscrew, as shown. As pressure is applied and the jaw is brought into contact with the work, the pins seek their own locating position and as the pressure of the jaw continues, the pins adjust themselves until a rigid clamping action takes place. The section 11 shows a side view of the design. It is also possible to provide a supplementary fixture in connection with vise jaws, such a unit being shown at **K**. The jaws are used only to hold the fixture in place, and

(Continued on page 54)

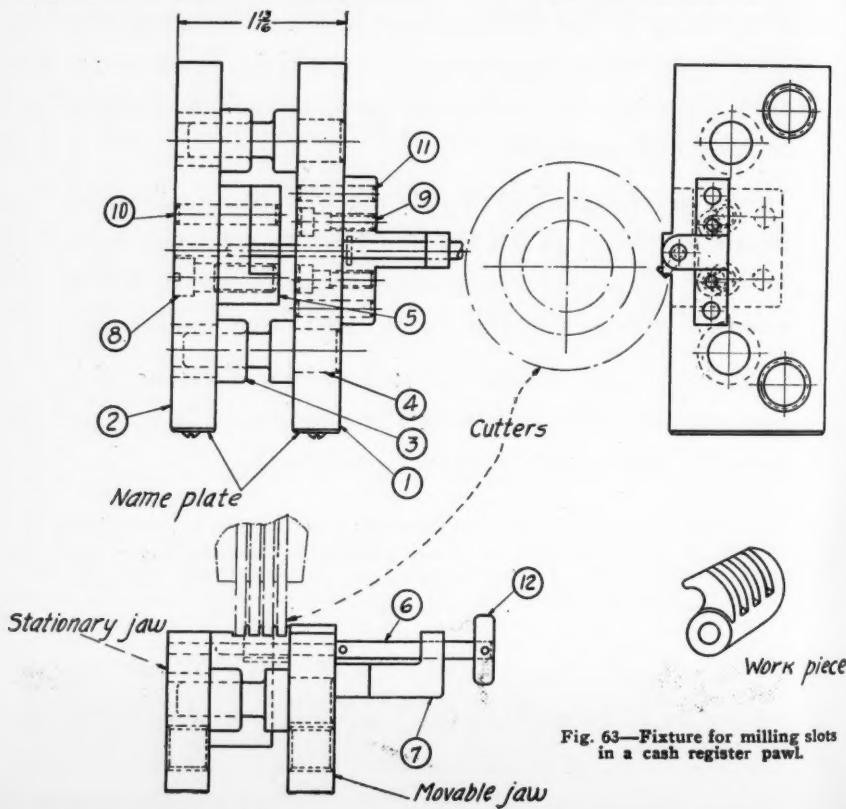
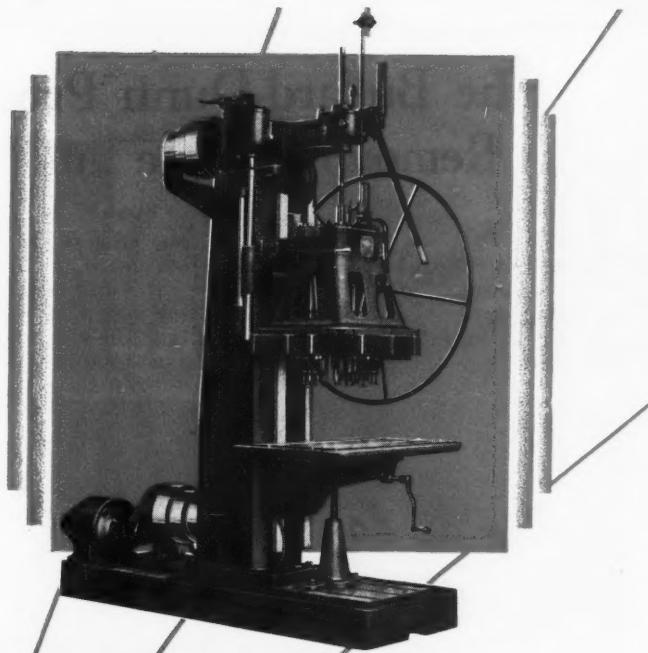


Fig. 63—Fixture for milling slots in a cash register pawl.



NATCO MODEL C-13 ADJUSTABLE MULTIPLE DRILLER AND TAPPER

Above is shown the NATCO Model C13 Adjustable Multiple Driller and Tapper. It is a medium sized machine, having a wide range of speeds and feeds and embodies every feature which recent developments in machine shop practice have shown to be essential for the rapid and accurate production of multiple drilling and tapping work.

Write for a bulletin covering this machine.

"NATCO Solves Your 'Hole' Problem"

THE NATIONAL AUTOMATIC TOOL CO.
RICHMOND, INDIANA, U. S. A.

The Bullard-Dunn Process of Removing Scale and Rust

A PROCESS of removing scale and oxides from metal surfaces by the action of hydrogen, electrically generated on the surface of the metal beneath the scale or oxide, has been developed by the Bullard Co., Bridge-

port, Conn. This method is known as the Bullard-Dunn process and is patented.

the process. In addition, a marked feature of the method is its ability to reach and thoroughly clean recessed surfaces that are inaccessible by mechanical cleaning methods such as sand-blasting or scratch-brushing.

Among other advantages of the process should be mentioned its simplicity of operation. Any ordinary shop man, after receiving brief instructions, can produce satisfactory results. Neither the composition of the cleaning baths, their temperature, nor their operation, require close control within accurate limits. Satisfactory results are obtained as long as the main principles of the

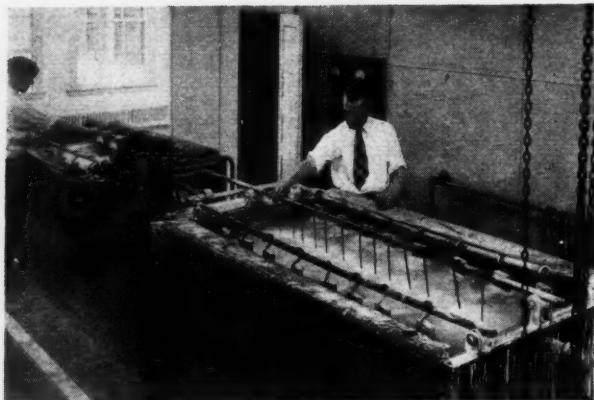


Fig. 1—Standard Bullard-Dunn Unit in Operation

port, Conn. This method is known as the Bullard-Dunn process and is patented.

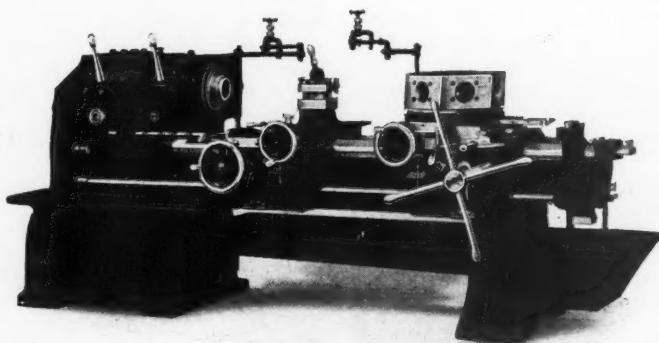
The outstanding feature of the process is that the cleaned surfaces of the original metal are not chemically attacked to cause erosion, no matter how long an object is immersed in the cleaning solution. The protection of the surface against pitting, etching, and hydrogen embrittlement is accomplished by a lead film which is instantaneously applied to the cleaned spots on the surface of the metal as soon as the scale or oxide is removed. This may be said to be the essence of

process and its operation are observed.

This principle involves the use of an electro-chemical bath consisting of a mixture of commercial sulphuric and hydrochloride acids with lead anodes. A second (alkaline) cleaning bath is also generally employed in connection with the process; this bath consists of ordinary caustic soda and trisodium phosphate with lead and iron anodes. In addition, hot and cold rinsing tanks are required.

A standard 6-volt generator, such as is used for electro-plating, is all that is needed to supply the current.

When only scale or oxide is to be



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Twelve reversible spindle speeds, all instantly available through two levers.

Roller bearing superior mounted spindle.

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Can be equipped with bar or chucking equipment, either being interchangeable without a great loss of time.

Can be furnished with either the Semi-Universal or Full Universal turret.

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removed, the tank with the sulphuric-hydrochloric acid bath, together with the rinsing tanks, is all that is required. When grease and dirt are also to be removed, the object to be cleaned is first immersed in the alkaline (caustic soda-trisodium phosphate) bath, which removes the scale and rust. If the protective lead coating already

being effective, it was also found to be economical.

At the present time, the process is used to a large extent in the Bullard plant for cleaning all surfaces of heat-treated alloy steel parts entering into the construction of vertical turret lathes and Mult-Au-Matics. Among the incidental advantages gained have

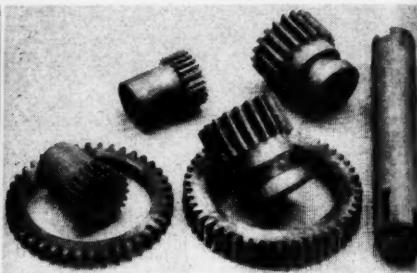
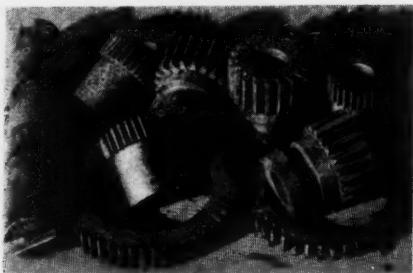


Fig. 2—Heat-Treated Parts Before and After Cleaning by the Bullard-Dunn Process

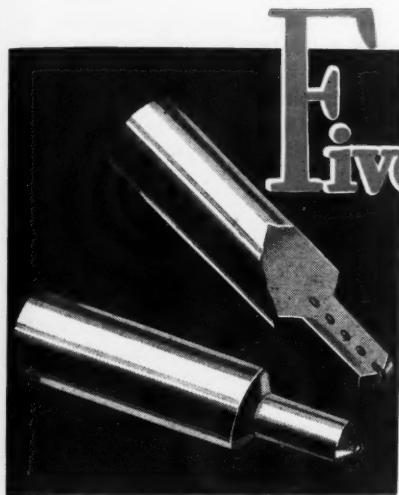
mentioned is objectionable on the cleaned object, it may be quickly removed by immersing the object in the alkaline bath and reversing the current. The general arrangement of the acid and alkaline tanks is shown in Fig. 1. At the present time the process has been applied mainly to objects of iron and steel, but it can also be used for cleaning other metals.

Four years ago, the Bullard Company began the manufacture of bumper bars for automobiles. One of the problems encountered was that of removing the black scale formed on the bumper bar parts during heat-treatment. The parts could not be polished satisfactorily until this scale had been completely removed. All the ordinary methods of removing scale, such as tumbling, sand-rolling, sand-blasting, pickling, and electro-plating, were tried without satisfactory results. During the research work inaugurated to find a method that would remove the scale completely, the process described was developed. In addition to

been a marked improvement in the ease of machining cleaned forgings and a greatly extended tool life because of longer runs between tool grindings. The absence of highly abrasive scale and oxides is the cause of this. In addition, savings in time and labor are made when polishing operations are required.

The original contours and dimensions of accurately machined parts such as gear teeth, splined shafts, keyways, and screw threads are not affected by the cleaning treatment. This makes it especially applicable to the cleaning of machine parts preparatory to the final finishing or assembling. It is also used for the cleaning of small metal-cutting tools such as milling cutters, drills, reamers, taps, and dies after heat-treatment. In the automobile industry, it may be used for cleaning such parts as transmissions, differentials, and gears and forgings of various kinds, as well as for parts to be electroplated.

Another application of this cleaning



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process which is of particular value is in the metal-stamping field, especially for deep drawing operations, where the scale formed during each annealing is detrimental to the life of dies and punches, as well as to the finish of the work. The drawing operations are facilitated by the lubricating effect of the lead coating resulting from the cleaning process. In the press shop toolroom, the process also finds application because it simplifies the cleaning of intricate dies after heat-treatment.

In the fabrication of stainless steel, there is a formation of chromic oxide from each annealing operation. This oxide is particularly harmful to dies and tools, and greatly increases the time and labor required for subsequent forming or polishing operations. A thorough removal of the oxide increases the life of tools and dies materially. The process also finds application in drop-forging plants. One of its advantages is that it makes it easy

to detect such inherent defects as cracks in forgings and "pipes" and "seams" in bar stock, as well as hardening cracks in heat-treated parts. Such defects show up clearly after the cleaning process. It can be easily applied to the cleaning of parts ranging in size from small screws and nuts to large gears, shafts, and forgings.

As a preliminary to electro-plating operations, the process has proved to be of very definite value in the Bullard plant. It produces thoroughly cleaned surfaces upon which the electrolytically deposited metal will spread more uniformly. The salt-spray tests used by the Bureau of Standards have proved definitely that electroplating on surfaces free from scale and oxide is less porous than when the surfaces are not clean.

While this method is patented, the Bullard Co. is prepared to license manufacturers to make use of the process in their own plants.

Modern Tooling Practice

(Continued from page 48.)

it is possible to use the same jaws for any number of fixtures.

A typical vise-jaw fixture for milling slots in a cash-register pawl is illustrated in Fig. 63. In this example, the parts of the fixtures are given detail numbers representing the usual procedure carried out in making assembly tool drawings, although in some plants such a list is made on a separate sheet. The list should include the detail numbers, the number of pieces required, the name of the part, and the material from which it is to be made. In operation, the workpiece (Fig. 63) is placed on the locating block, detail 5, and the locating plug, detail 6, is pushed through

the previously reamed hole. The vise is then closed, so that the pawl is securely gripped, in which position it is ready to be milled. At the lower right-hand section of the drawing is shown an enlarged view of the pawl. The slots are $3/32$ -in. in width. A gang of four cutters is required to complete the operation. The vise jaws are made with guide pins to insure proper alignment and to aid in maintaining the accuracy required.

The oil with which new files are lightly coated should be removed before using the file on cast iron; the teeth will cut more easily. On fibrous material, however, the oil helps.

Kerosene or gasoline will remove the oil from the teeth.

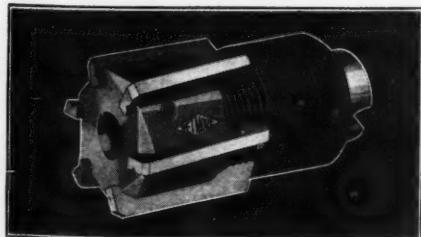


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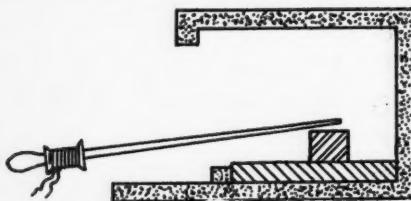
Ideas From Readers

This department is a clearing house for ideas. If there is a "kink" or short-cut in use in your shop, send in a description of it. We will pay \$5 for each one published.

Home-Made Electro-Magnet For Heat Testing

By CHAS. R. WHITEHOUSE

WITH all the modern equipment that has been developed for indicating and recording the temperatures of materials in process of heating, there are still many places where the old method of using a horseshoe magnet on a rod to test the tempera-



Heat-Testing with Electro-Magnet

ture of a piece of steel is still in use. The horseshoe magnet method has disadvantages, however, which are eliminated when the magnet illustrated here is used.

The equipment consists of a wire coil wound magnet, a steel rod, and a 6-volt battery. The magnet is made by winding 900 turns of No. 28 enameled magnet wire on an iron spool that is approximately 4 in. long by 1½ in. diameter, and then connecting the wire with the battery terminals. The spool should be bored to a press fit on the rod, over which it is pressed down to the handle, as shown. The rod should be just long enough to reach into the furnace comfortably, as a rod that is too long over-balances itself. The lead wires should be rub-

ber-covered to prevent "grounds" and damage in handling. In use, the rod is held lightly in the hand, with the end of the rod in the furnace and directly over the piece being heated. When the metal no longer attracts the rod, it is at the critical point of temperature. The rod should not be held in the furnace any length of time, however; it should be inserted only long enough to make the test and should then be pulled out, as the extreme heat would affect it if it were held in the furnace too long.

Forming Rivet Sets With Steel Ball

By RICHARD H. KIDDLE

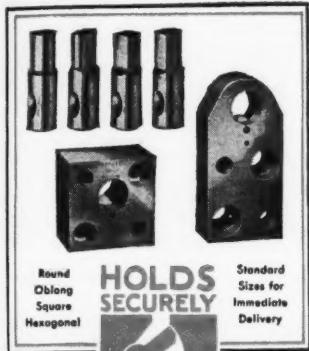
SOME time ago the writer was given the job of making a quantity of rivet sets. By using a steel ball and the method described below, I made a dozen sets in such quick time that the superintendent came to ask me how I turned them out so quickly, and did such a good job in such a short time.



Forming Rivet Set
With Steel Ball

I first cut the pieces of tool steel to the proper length, then I placed them in the fire to heat. I then placed a steel ball on the anvil and when the ends of the sets were hot enough to be soft, I placed the end of each set over the ball and struck the opposite end of the set with a large hammer, driving the ball into the end of the set and forming a perfect radius. The

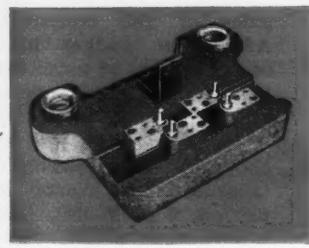
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ends of the sets were then hardened and trimmed to shape by grinding. The radius in the end of the set can be formed in this manner much quicker than by the use of a form tool or radius cutter, and a better job is obtained. The size of the ball is, of course, governed by the size of set required.

Fixture for Turning Locomotive Crossheads

By JOHN McCULLAGH

THE turning of locomotive crossheads is not always a simple task, due to the fact that there are so many surfaces that must be machined in alignment with each other. One of the more successful methods of turning and boring the piston pin end involves the use of the fixture shown in the illustrations. The operation is performed in a vertical turret lathe, equipped with the necessary boring, turning and facing tools. The fixture is shown in Fig. 1 with a finished crosshead.

The knuckle-pin hole through the crosshead is first bored and reamed

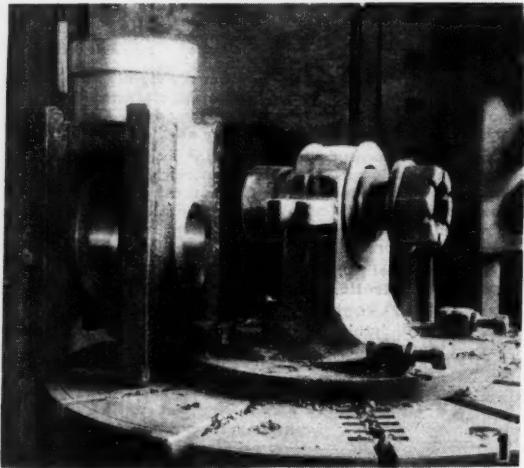


Fig. 1—Fixture for boring and turning piston-pin end of crosshead. Finished piece shown at left.

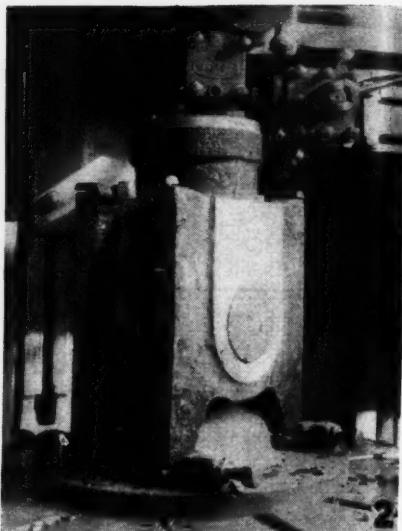


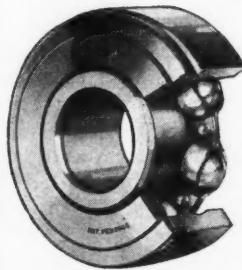
Fig. 2—Fixture with piece in position for machining.

and then the outside and inside faces are finished to the proper dimensions. All subsequent operations are located from this hole. In loading the crosshead in the fixture, it is slipped into place over the projecting member, after which a pin is fitted through it. Alignment is obtained by the use of four adjustable wedges mounted on the fixture base, which are adjusted and fitted under the four projecting ends at the guide sides of the crosshead. After the wedges have been properly adjusted and the crosshead is properly aligned, two off-set strap clamps are attached as shown in Fig. 2, where a crosshead is shown in process of machining. The fixture enables the operator to load a crosshead rapidly and assures proper alignment with the knuckle-pin hole.

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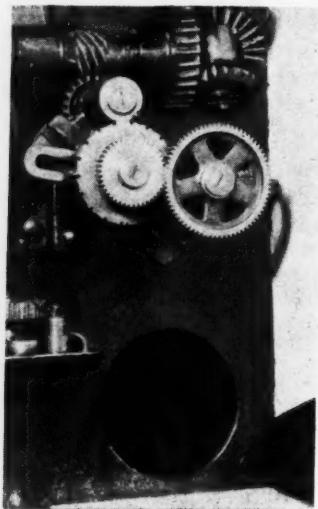


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18:1 Ratio Spur Gearing

By FRED ROSS EBERHARDT

UPON making ready to do a special job on the hobbing machine, it was found that the regular feed gears, as provided by the machine manufacturer, did not provide a slow enough feed. The greatest reduction ratio available was 4:1 compounded by 4:1, giving a total reduction of 16:1. The



18:1 ratio gearing in place.

special job required a reduction of 54:1.

As it was difficult to install another gear compound, a pair of intermittent gears were used for the first reduction. The driving pinion was made with only one tooth, and the driven gear with 18 tooth spaces and 18 pauses. This arrangement gave a reduction of 18:1, and when the 3:1 gear train was compounded by the intermittent gears the desired ratio of 54:1 was obtained.

Upon making a trial layout of the intermittent gears, it was found that the "dead line" or pitch circle of the driving pinion blotted out three teeth

of the driven gear. Movement of the one tooth of the driving pinion past the driven gear carried the driven gear a distance equal to three "pitches," or three teeth and three spaces, so in order to obtain a ratio of 18:1, it was necessary for the driven gear to be of a diameter to take 18 times 3 teeth, or 54 teeth. The driving pinion in such a case may be of any convenient diameter.

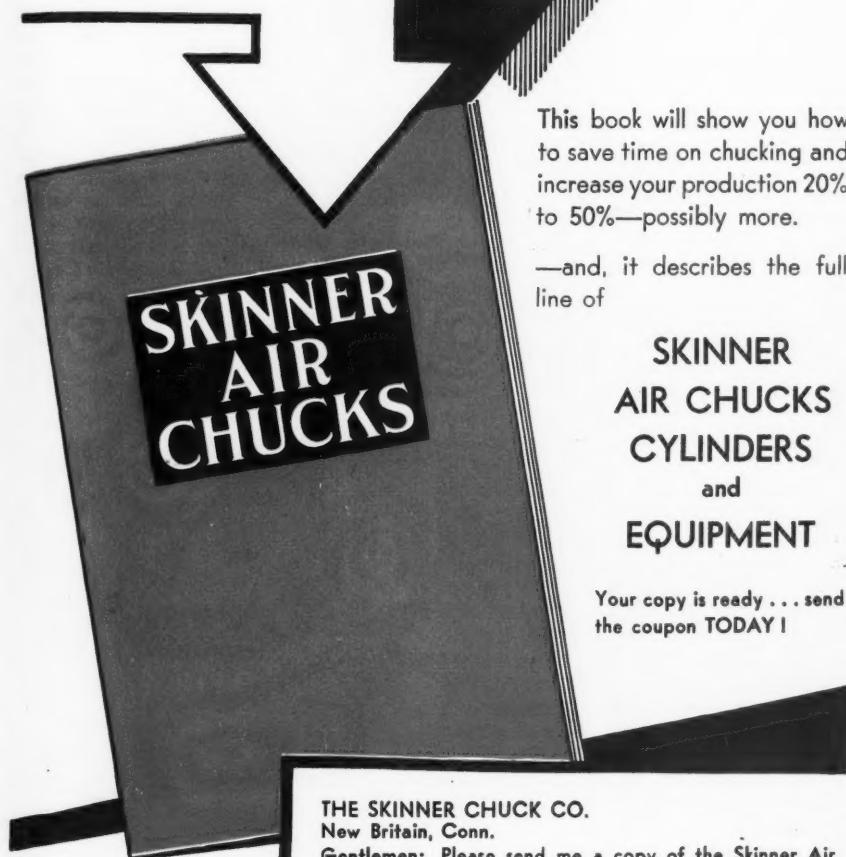
To cut the teeth, we geared the machine for the number of teeth which the driving pinion would have if teeth were cut all the way around, and then milled two spaces, obtaining one full tooth. We then milled all the stock off the driving pinion down to the pitch diameter, leaving the one tooth sticking up, and followed by milling 18 spaces in the driven gear. A fly cutter of the same diameter as the pitch diameter of the driving pinion was then used to mill concaves in the pauses on the driven gear, so that they would fit the periphery of the pinion, as shown in the illustration. After machining the gears, they were mounted on studs and the corner interference was noted so that it could be filed off. In making similar gears, however, care must be taken not to file off the corners too much. If the machine work is done carefully, it will not be necessary to touch a file to the pinion "dead line," nor to the gear pauses.

Standardization Cuts Investment In Dies

By PAUL A. BARD

MANY operations are performed in the punch press, such as blanking out washers of different thicknesses, piercing and forming progressive operations where the thickness of the piece necessitates different clearances between punch and die or where

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different punches are required while using the same die.

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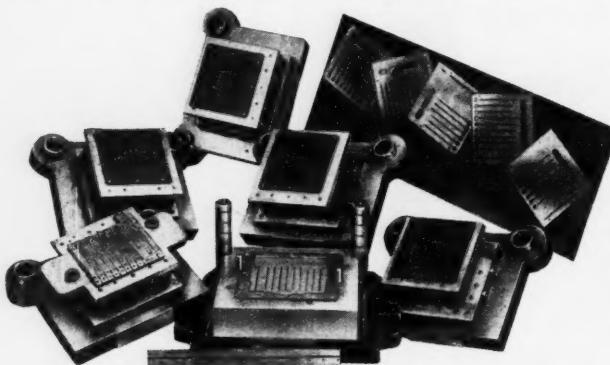


Fig. 1—One Die Holder Equipped With Five Punch Holders, Possible Because of Interchangeability of Design

ment is taking advantage of the standardized, interchangeable die set, to minimize the amount of die building required, which involves, of course, the first cost of die sets, the cost of steel for the die as well as the die maker's time, rack space, inventory, etc. The illustration shows one die mounted in a Danly standard interchangeable die set, equipped with five distinct and separate punch holders, each with its individual punch, stripper plate, etc.

Because the die set is completely interchangeable, it is possible to use five punch holders to the one die holder. In the instance shown, it so happens that the punches are all different while only one die is used. The blanks are shown in the upper right-hand corner of Fig. 1. A similar instance, though a much simpler one, is that employed where washers are to be blanked out of different thicknesses. In such instances, it is necessary, of course, to employ a different size punch or a different size die, with increasing thickness, according to whether or not the hole in the washer is to remain of the same diameter.

The advantage of using several

punch holders as in the case shown is that it reduces the number of die sets required, minimizes the amount of die-making and set-ups necessary while

conserving rack space, tool room detail and investment. Moreover, it enables the punches to be touched up while another punch is in use, facilitating steadier production. In many instances, due to interchangeability, it is possible to operate different presses at the same time, and to switch punch holders or die holders around. Consequently the interchangeability feature is very valuable.

Another advantage of interchangeability of dies is well brought out in

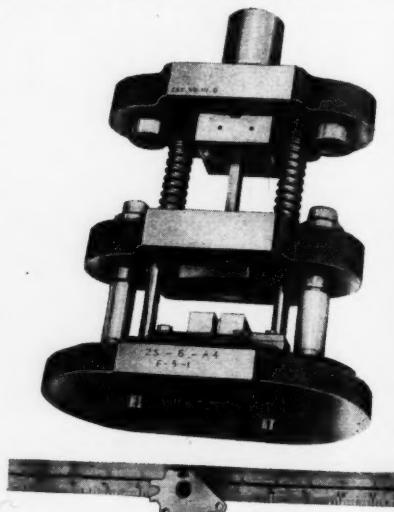


Fig. 2—One Die Set Using Two Punch Holders, Upper One for Broaching Operation.

Fig. 2. Here a second punch holder is mounted above the die set to perform a broaching operation. The piece

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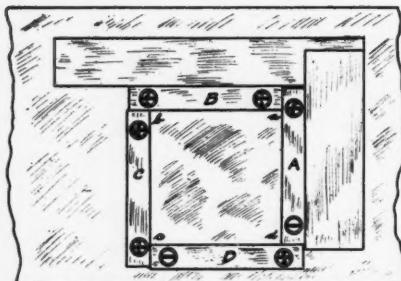
produced is shown below the die set and is seen to measure slightly over $2\frac{1}{2}$ in. With one operation of the press, two operations are performed upon the piece, the first punch blanking out the piece, with the broaching operation following. It should be noted, moreover, that punch holders and die holders are held in perfect alignment by the hardened steel guide posts and bushings which are hardened, ground and lapped to fit without perceptible shake.

Method of Testing a Square

By R. H. KASPER

The common method of testing a square by scribing a line along the blade, reversing the head and scribing another line to see if the two correspond, may suffice for ordinary purposes, but if perfect accuracy is desired, a better method must be pursued. The following test may be quickly performed and is capable of absolute accuracy.

On a straight plate, the four plates A, B, C and D are fastened loosely to



Testing a square.

form an approximate square. Plate A is first tightened securely. Then, with the head of the square set against plate A, plate B is set against the blade. Then, with the head of the square set against plates B and C, the plates C and D, respectively, are set

against the blade, working around in the same direction. After all the plates are tightened, the head of the square is set against plate D, and the blade against plate A. Any inaccuracy will be shown multiplied three times between plate A and the blade of the square. For instance, to exaggerate, if the square is one degree acute, angles A, B and C will each be 89 degrees, as plates A, B and C are set to the square. Angle D must therefore make up the deficiency of the other three to make a total of 360 degrees, which is the sum of the angles in any four-sided figure. Angle D will, therefore, be 93 degrees, or three times the error of either of the other three angles. After the square has been corrected, and as a final check-up, the process may be performed twice around in the same direction, which will increase the error seven times, so that the slightest inaccuracy of the square may readily be detected.

Draw filing is the act of filing while holding the file at approximately a right angle with and moving it side-wise over the length of the work.

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The Societe Genevoise d'Instruments de Physique of Geneva, Switzerland, for whom The R. Y. Ferner Company, Investment Bldg., Washington, D. C., is exclusive agent in the United States, has issued Catalog No. 508 in which the high precision linear and circular dividing machines made by this company are described and illustrated. The methods by which the extreme accuracy possible with these machines is obtained are explained in detail and the various sections of the machines are illustrated. The book contains thirty-six $8\frac{1}{2} \times 11$ in. pages devoted entirely to the subject of dividing engines. Copies will be furnished without charge to executives who are interested.

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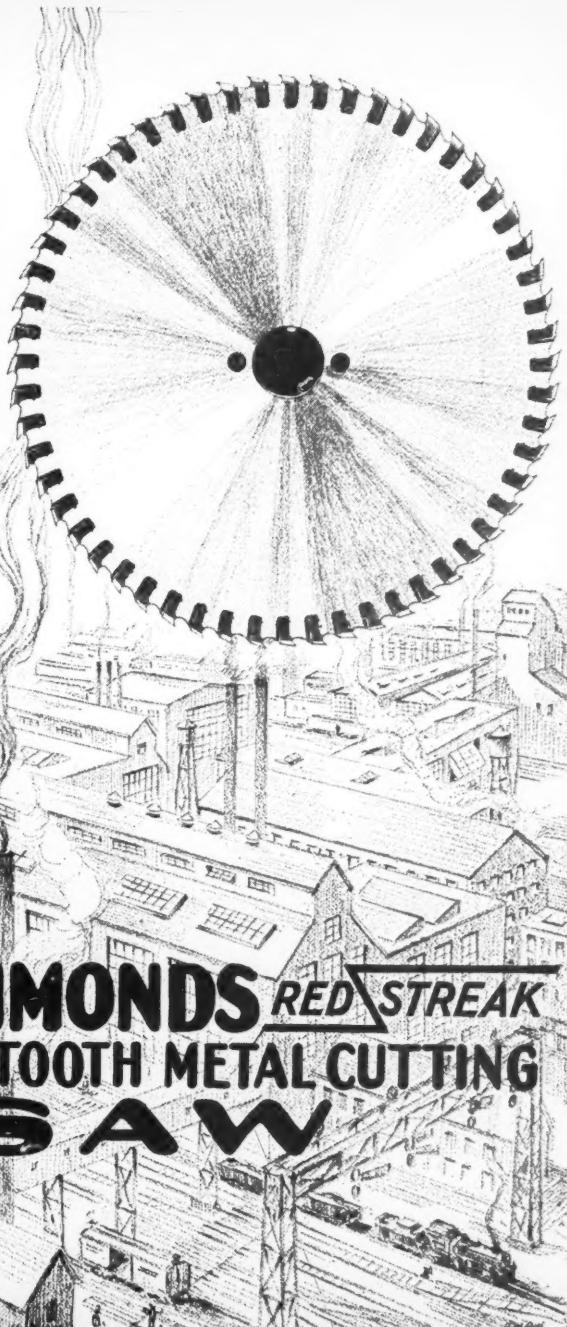
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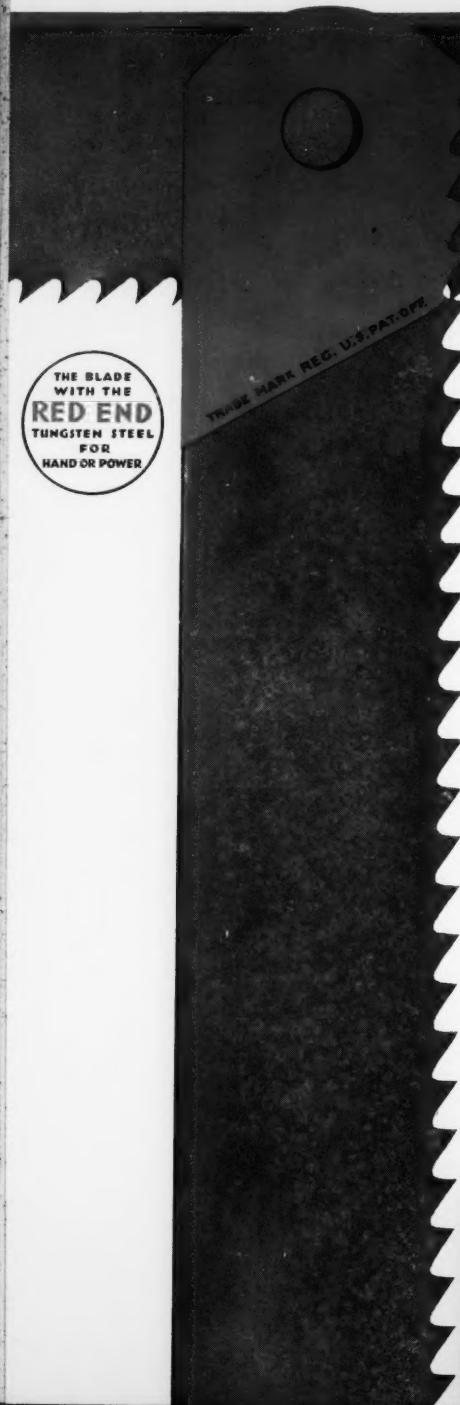
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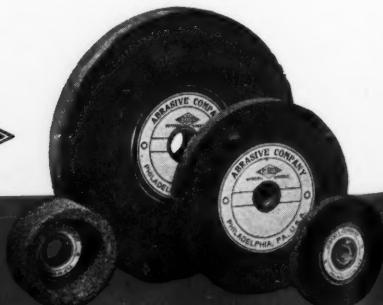
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For Tool Makers

Over the Editor's Desk

Modern Civilization and the Machine Tool

THE important part played in modern civilization by the machine tool industry was graphically portrayed to his listeners by Ernest F. DuBrul, General Manager of the National Machine Tool Builders' Association, in a recent radio address. The average merchant, dentist, or plumber knows in a general way that his goods or equipment are produced by machinery, but they are few indeed who have any real conception of the extent to which commerce and industry as a whole are dependent upon the machine tool. Mr. DuBrul said:

"In a way, our whole civilization is like an inverted pyramid standing on its small end. Our millions of people get their goods from several hundred thousand stores, but these stores get their goods from only about 200,000 factories. Then of the 200,000 factories of all sorts in this country, only about 10,000 make the industrial machinery which the other 190,000 use. Of these 10,000 machine shops, only 350 make the machine tools, the machines with which all other machines are made, including their own kind.

"Imagine what would happen if some superhuman power were to destroy all the machine tools in the world and prevent us from making any more. We could make no more automobiles, electrical devices, household conveniences, plumbing fixtures, railroad equipment, airplanes, steel ships, movies, no more machinery of any kind. All other machines we have would soon stop running.

"In a very short time we would have to go back to the primitive methods of production and transportation, and many of us would starve to death before the world got settled down at the

low standard of living that prevailed only 150 years ago."

The machine tool is an important part in the machinery of civilization, and both those who make machine tools and those who use them can take a pardonable pride in the service they are performing.

The Thirst For Knowledge

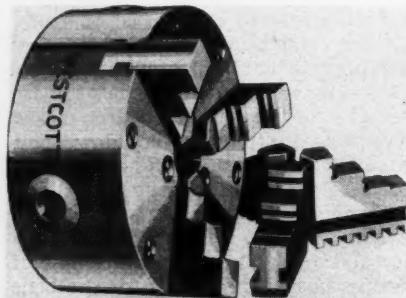
ONE of the "signs of the times" is the growth of interest in study. The accumulation of knowledge is fast becoming a national hobby—and not alone for those to whom the ordinary sources of knowledge were closed. Everyone is studying, including thousands who left the graduation platform behind them long ago. Colleges and schools on every hand are offering evening courses to those in the vicinity and many universities are now offering extension courses for the benefit of the many who wish to study at home. Even the more progressive of the industrial plants are getting their manufacturing executives into the study habit by putting them through well-planned training courses.

The superintendent of a tool shop in Detroit decided to irrigate his knowledge of trigonometry and geometry by taking a course in higher mathematics at a night school. During his first evening at school he found that he had as classmates a superintendent of one of Detroit's largest automobile plants, the master mechanic of a large stamping plant, the superintendent of the die division of another large stamping plant, the chief tool designer of one of the largest automobile plants, the general manager of a well-known stove manufacturing plant, and a large number of machine shop foremen. Study will soon eclipse even Tom Thumb golf as a national hobby—and is much more remunerative.

New Shop Equipment

Westcott Bevel Geared Scroll Universal Lathe Chucks

The Westcott Chuck Co., 124 E. Walnut St., Oneida, N. Y., has announced a new line of bevel geared scroll universal lathe chucks, the outstanding features of



Westcott Bevel Geared Scroll Universal Lathe Chuck With Two Sets of Jaws

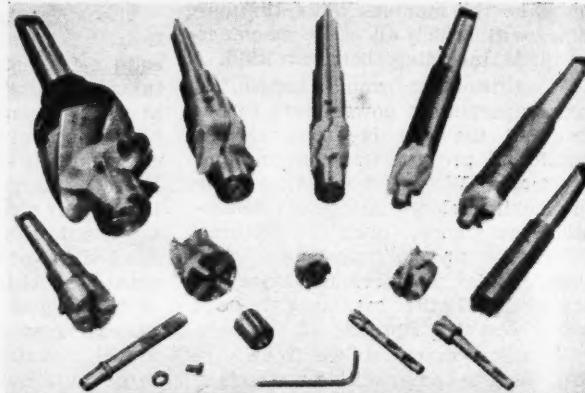
which are accuracy and strength. The chucks are intended to meet a demand for a lathe chuck which is extremely accurate, at the same time possessing the strength necessary to meet the requirements of modern production methods where Carboly or other tungsten carbide tools are used.

The chuck body is of one piece, insuring a maximum of strength. The bodies for the smaller sizes, such as the 3 in., 4 in., 5 in., and 6 in. chucks, are steel forgings. The bodies for the larger sizes are of semi-steel and electric steel. Special grades of steel are used for jaws, scrolls, and pins.

The chucks are made in the following sizes: 3 in., 4 in., 5 in., 6 in., 7½ in., 9 in., 10½ in., 12 in., 15 in., 18 in., 21 in., and 24 in. The last three sizes mentioned are extra heavy. Sizes above 24 in. will be made to order. The chuck is furnished with two sets of jaws, one set being intended for either outside or inside chucking at the option of the user, the others being of the two-piece reversible type.

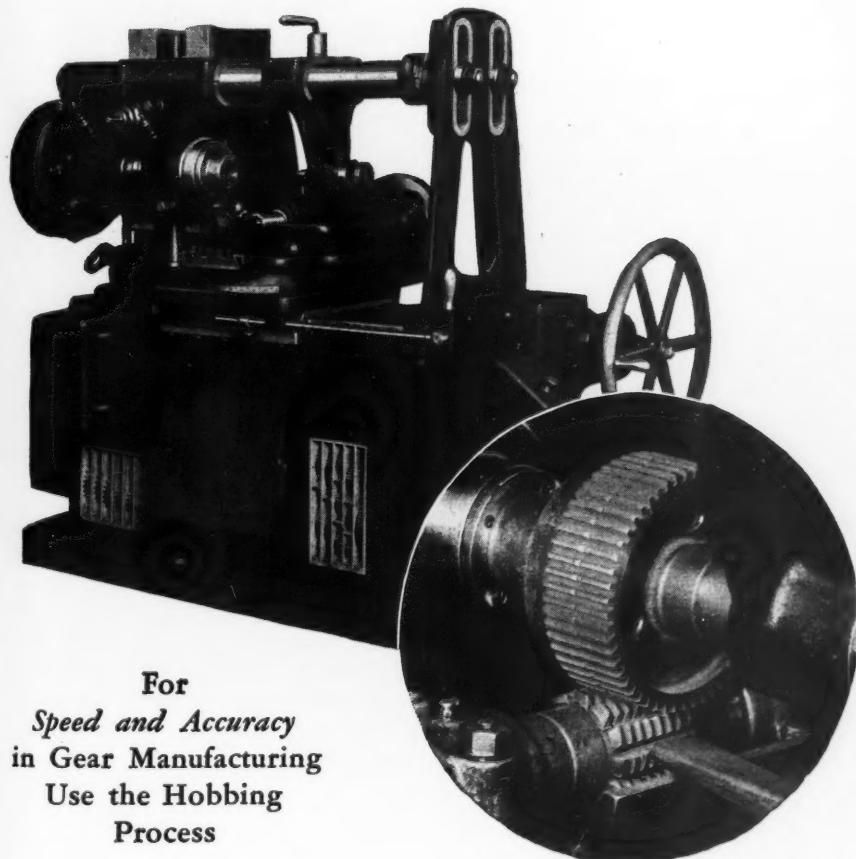
National-Cleveland Style "B" Double Key Drive Interchangeable Counterbore and Spotfacer

The National Tool Company, Madison Ave. at W. 112th St., Cleveland, Ohio, has brought out a tool known as the Style "B" Double Key Drive Interchangeable Counterbore and Spotfacer, so-called because the cutting tool is held to the holder by two keys—one on the holder and the other on the cutter. This construction is intended to insure maximum driving strength and permanent alignment of the cutter with the holder, regardless of whether the tool is sweeping a complete circle or a partial circle, and makes it an excellent tool for angular



National-Cleveland Style "B" Double Key Drive Interchangeable Counterbore and Spotfacer

BARBER-COLMAN HOBBING MACHINES



For
Speed and Accuracy
in Gear Manufacturing
Use the Hobbing
Process

BARBER-COLMAN COMPANY

General Offices and Plant—Rockford, Ill., U. S. A.

lar counterboring. In addition to these features, the construction of the tool permits practically instantaneous change of cutters.

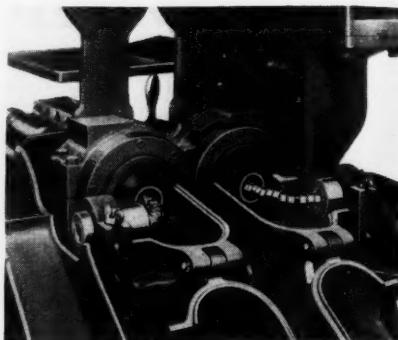
The cutters are of high speed steel, with pilots and holders of alloy steel, and all parts are hardened and ground. Either solid or roller pilot can be supplied, within certain ranges, the solid pilots affording smaller sizes on the small size tools, and the roller pilots affording larger sizes than can be obtained in the solid pilots. All parts are ground to close fits.

Threadnut No. 1 Automatic Nut-Tapping Machine

A double-spindle automatic nut-tapping machine with a range from $\frac{1}{4}$ -in to $\frac{1}{2}$ -in. hexagon or square nuts, known as the Threadnut No. 1, has been announced by the Automatic Nut-Thread Corporation, 3619 N. Eighth St., Philadelphia, Penna. The machine is designed along the lines of other Threadnut models, using bent shank taps which remain stationary while the nut blanks are revolved.

The special feature of this machine consists in the two tapping spindles,

which are fed by a single hopper of the rotary disc type. Two centrifugal pumps are provided, one for each spindle, to assure that plenty of coolant will be applied to the taps. An additional safety feature is provided in that should one of the spin-

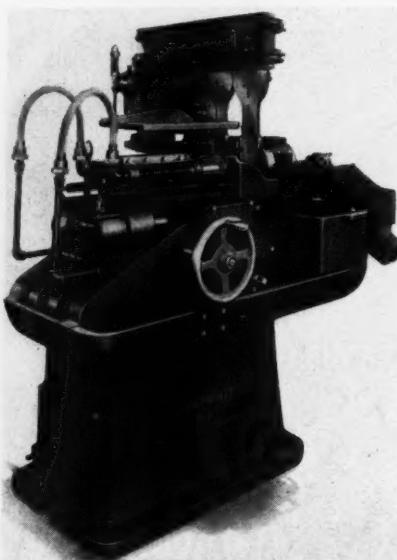


Discharge end of spindles with housing thrown back showing taps

dles become clogged for any reason, the nut pusher on the spindle will immediately compress and the other spindle will continue operating until the operator has had a chance to remove the obstruction.

All important parts are mounted in ball bearings. All gears are of steel, fully enclosed and running in a bath of oil. Change gear boxes, easily accessible, are provided so that changes in tapping speed or lead can be easily made. The standard machine is furnished with single clutch pulley for belt drive. Provision is made for motor drive, however, using hinged brackets at the rear of the machine, under the pan, so that the motor is out of the way and floor space is conserved. Either multiple "V" belt, silent chain, or flat belt is optional for motor drives, proper guards being supplied.

The machine is especially designed for high production and accuracy of the tapped nuts as to pitch diameter, lead and squareness with the face of the nut. Under test, the machine has produced $\frac{3}{8}$ -24 S. A. E. hexagon nuts at a rate of 3,120 per hour.



Threadnut No. 1 Automatic Nut-Tapping Machine

"American" 10-Spline Broaches

The broaches shown in the illustration were made by the American Broach & Machine Co., Ann Arbor, Michigan, to broach nickel steel transmission gears for steam shovels. The gears were approximately 6 inches in length. The fea-



WILLIAMS' QUALITY

IN A COMPLETE NEW LINE OF

SOCKET WRENCHES

Williams' Industrial Socket Wrenches offer complete equipment for every type of service. A full assortment of Handles and Parts, combined with Williams' Sockets, provides a wrench system of unusual efficiency. Three separate and distinct Industrial Patterns as follows:

STANDARD PATTERN— $\frac{1}{2}$ inch Square Drive, includes Sockets with Double-Hex, Hex and Square openings up to 1 inch for ordinary needs.

HEAVY DUTY PATTERN— $\frac{3}{4}$ inch Square Drive. Sockets have Double-Hex openings $\frac{7}{8}$ to $1\frac{5}{8}$ inch. This line is made for harder service than required in the ordinary run of work.

EXTRA HEAVY DUTY PATTERN, with 1 inch Hex Drive and Sockets with Double-Hex openings $1\frac{1}{16}$ inch to $2\frac{1}{2}$ inch, is specially designed for the toughest sort of service. Its rugged strength is ample for the hardest jobs.

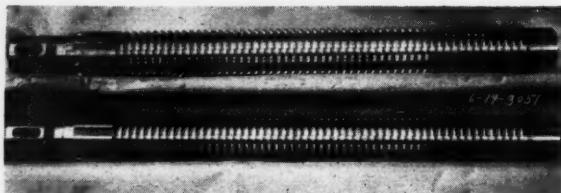
Special Alloy Steel provides extra strength; Williams' high standard of quality is maintained throughout. Guaranteed against breakage. Sold individually, or in sets. Ask for complete details.

J. H. WILLIAMS & CO.

"The Wrench People"

New York BUFFALO Chicago

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
DETACHABLE
SOCKET WRENCHES



"American" 10-Spline High Speed Steel Broaches.

ture of the broaches is the fact that they are of unusual size and were made of high speed steel. Each broach is 6 inches in diameter by approximately 5 feet long, and is of the 10-spline type. The time required to pull one of these broaches through a nickel steel gear, using an American broaching machine, was 40 seconds.

Norton Car Wheel Grinding Machine

The illustration shows a car wheel grinding machine that has been brought out by the Norton Company, Worcester, Mass. The new machine replaces the older model which, with minor changes and improvements, has been used by many of the leading railroads for the past twenty-five years. This machine has been developed from the experience gained in the study of car wheel grinding throughout this period as accomplished in the many railroad shops employing the older type of machine.

The method of grinding with the new machine as compared with the older one is in accordance with the recommendations of the A. R. A. The wheels are ground true and concentric while revolving on their own journals. The machine will grind car wheels up to 44 in. in diameter and engine truck wheels up to 36 in. in diameter. The minimum diameter of wheels that can be ground is 20 in. Only standard 4 ft. 8½ in. gauge wheel mountings are accommodated in this machine.

The arrangement of work supports is optional. Those shown in the illustration are for standard axles with journals

3 to 9 in. in diameter. The supports are adjusted for height by means of convenient hand wheels, and endwise shifting of the axle is prevented by adjustable ball thrusts. Work supports for ball or roller bearing axles can be supplied if desired.

Two complete grinding wheel units are employed, one for each of the car wheels, the units being motor-driven and individually controlled. The grinding wheel slides rest on wide ways, one flat and the other Vee. Hand wheels on ball-bearing-mounted feed screws control the feed of the grinding wheels, and there are also hand wheels on the sides of the machine for aligning the grinding wheels in correct relation to the work. Each slide is independently reciprocated by power $\frac{1}{8}$ to $1\frac{1}{2}$ in., thus providing automatic traversing of the grinding wheel to assure more even wheel wear. Two traverse or reciprocating speeds are available.

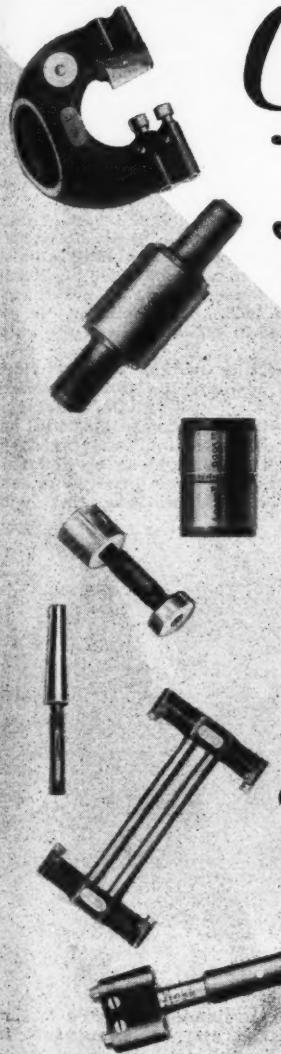
The grinding wheel spindles are mounted in large pre-loaded precision ball bearings. Grinding wheels are mounted on the tapered ends of the spindles, the standard size of wheel being



Norton 44-In. Motor-Driven Car Wheel Grinding Machine. Loading side is shown with car wheels in place.

24 x $2\frac{1}{2}$ x 5 in., although guards to take wheels up to 4 in. thick can be supplied when required. A gauging device not shown in the illustration is used to insure both car wheels of the pair being of the same diameter when ground. The five motors on the machine are all controlled from push button stations convenient to the operator, and an auxiliary

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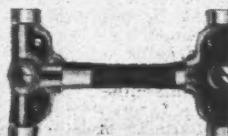
"Standard" Gages—accurate and dependable—are speeding production in thousands of plants. The sturdy construction and high grade workmanship guarantees the accuracy of these gages over a long period of time.

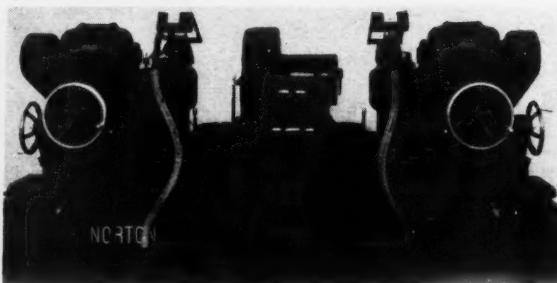
"Standard" Gages will improve the accuracy of your work. Our Special Gage Department is at your disposal; consult us on your requirements.

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—it tells more about the Supreme Accuracy
of "Standard" Gages.*

STANDARD GAGE CO.

INCORPORATED
POUGHKEEPSIE, NEW YORK.





Operating Side of Norton Car Wheel Grinding Machine

push button station is located on the loading side of the machine for starting, stopping or jogging the work while loading or unloading. The motors used include two 25 h. p. wheel drive motors, one 10 h. p. work drive motor, one 1½ h. p. pump motor and one 3 h. p. motor for the wheel slide reciprocating drive. The overall floor space is 13 ft. 8 in. x 11 ft. 5 in. and the approximate net weight with motors is 35,000 pounds.

Sykes Gear Generator No. 1-A

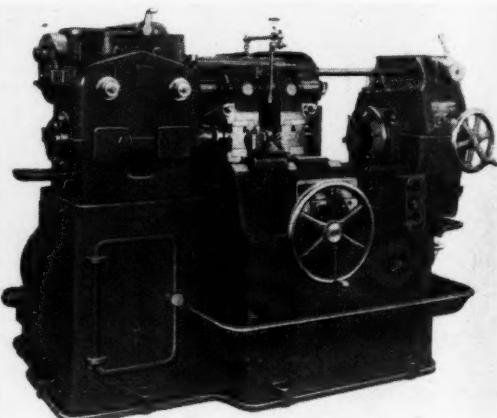
A new size Sykes Generator, designed primarily for use in the automotive industry, has been developed by The Farrel-Birmingham Company, 346 Vulcan Street, Buffalo, N. Y. The machine has a diameter range of $\frac{1}{4}$ to 12 inches and will cut all pitches from 24 D. P. up to and including 4 D. P. The principal features of the machine are its high speed — it will operate at 850 strokes per minute — and its extreme precision.

Like all Sykes gear generators, the machine will not only cut continuous-tooth herringbone gears having sharp apices, but will also cut either straight tooth spur gears or single helical gears. Another valuable feature consists in that both gears of a cluster combination can be cut simultaneously, whether the pitches are the same or different. The two cutters utilized in this machine are mounted face to face so that as one cutter cuts in one direction, the other cuts in the opposite direction. The machine is well adapted for cutting herringbone gears having a groove in the

center of the face. Such gears may have different pitches on the right and left hand helices.

The machine is of extremely rigid construction. The main spindle is of large diameter with a hole of $3\frac{3}{4}$ in. dia. extending through it. A substantial support is provided for the outer end of the work arbor. The distance from the end of the main work spindle to the arbor support is relatively large, permitting a wide range of work to be mounted in the machine. The standard cutters for the machine are 4 in. diameter, but cutters up to 6 in. diameter may be used. Although the machine is listed for a maximum pitch of 4 D. P., it will cut 3 D. P. when cutters larger than 4 in. dia. are used. The machine is extremely rapid in action and is fully automatic.

Ease of setting up has been provided for, and all adjustments for the cutters are controlled by one handle, making it possible for the operator to make all necessary settings without moving from his position. The guides have double grooves instead of single grooves as used heretofore. The shoes engaging with



Sykes Gear Generator No. 1-A

these guides are easily adjusted to eliminate backlash and to compensate for wear.

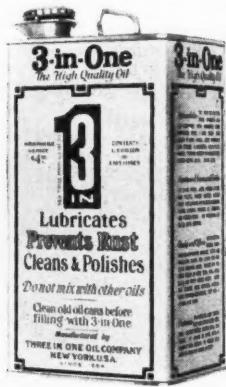
The cutter spindles are hardened.

INSTANT LUBRICATION

... 3-in-One is "geared" to High-Speed needs

ORDINARY lubricants seldom supply the full protection required by high-speed equipment. Such oils usually distribute too slowly and unevenly, leaving vital working parts exposed to frictional wear.

Three-in-One Oil is "geared" to high-speed requirements. It flows instantly to every point where oil is needed. And because it is blended from three different oils—animal, mineral and vegetable—it has *extra penetrating power* which no ordinary oil possesses. It goes at once to the heart of even the tightest bearings, completely coating working parts with its protective film. And it *lubricates* perfectly. Many manufacturers use 3-in-One for still another purpose—to *prevent rust* on metal products in storage and transit.



Most supply houses now have the economical Gallon Cans. But if yours does not, order direct. Write for circular and prices.

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*Expect New
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Thor
ROTARY AIR
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**LIGHT IN WEIGHT
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HERE is a new line of grinders attaining new heights of performance. The efficiency of air-operated tools has never before been so great.

The outstanding advantages of Thor Rotary Air Grinders are Light Weight—Governed Speed—Increased Power—and Lack of Vibration. Due to the Rotary Principle and THOR Governor, their air consumption is extremely low and their upkeep costs are remarkably small.

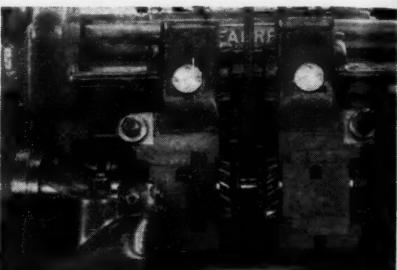
There is a size and type of THOR Grinder to meet every requirement. From 28,000 R. P. M. and 1½-inch wheel to 4,300 and an 8-inch wheel, the THOR line of Grinders is complete.

Send for Bulletin 109, which illustrates full line of Thor Rotary Air Drills and Grinders. It is very interesting.

TOOLMAKERS SINCE 1893

INDEPENDENT
PNEUMATIC TOOL CO.
236 SOUTH JEFFERSON ST., CHICAGO

ground and lapped, and the bearings are lapped to fit. Practically all other bearing surfaces are of case hardened steel. A new relief mechanism which works positively and silently has been developed for this machine. When the cut-



Cutter Mechanism Showing Two Helical Cutters in Position

ters are in cutting position, they are locked rigidly. All index worms are case hardened and ground and the index worm wheels are cut on a special hobbing machine which was designed expressly for generating precision dividing wheels. The floor space occupied is 6 ft. x 4 ft. 7 in., and the shipping weight is 7,500 pounds.

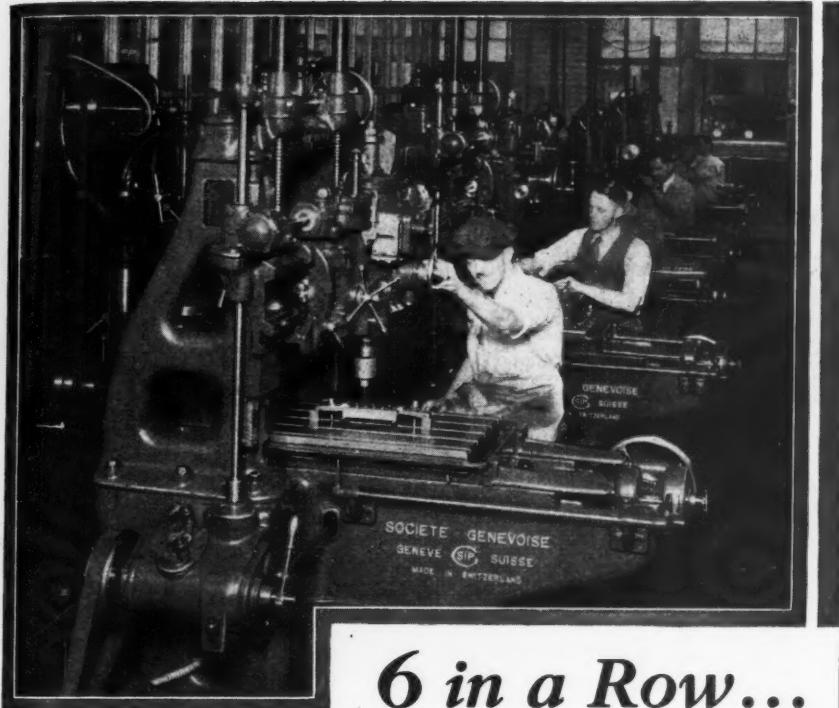
Gerstner No. 33 Tool Chest

H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio, have designed and placed on the market a new style tool chest, known as the No. 33. The chest



Gerstner No. 33
Tool Chest

has a deep top compartment measuring 8½ in. high inside, to provide for breast drills, planes, and other large tools. It also has a rack for saws and a square. Smaller tools are taken care of in the felt-lined drawers, which measure 4½, 8½, and 14½ in. long and are from ½ in.



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These 8 machines show what *Richard Bros. Division of Allied Products Corp.*, Detroit, makers of interchangeable dies, think of the

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Thirty other companies in the United States have two or more of these machines which pay for themselves in so short a time.

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STOP!
says priming.
GO!
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Where high-speed production is demanded, the modern machine-tool users specify **GUSHER** Coolant Pumps as standard equipment. Coolant pumps that have to be primed are a liability to the shop that has a time schedule to meet. **GUSHER** Pumps are always ready to **GO** and **GO INDEFINITELY** . . . without priming.



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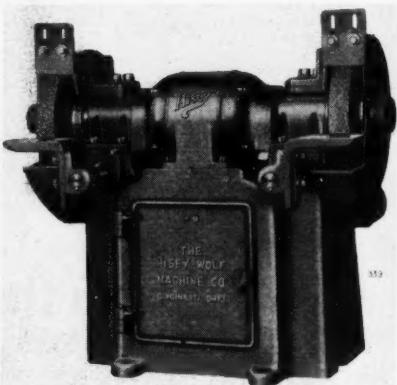
532 East Front Street

CINCINNATI
OHIO

to 2 in. high. The front lid is self-hinging and slides on steel bearings under the bottom drawer. It locks automatically when it is closed and the top lid is down. Covered with a waterproof leatherette, it is especially adapted for use by patternmakers, millwrights, maintenance men, and other mechanics.

Hisey Floor Stand Grinders

The Hisey-Wolf Machine Co., Cincinnati, Ohio, has brought out an improved floor stand grinder in three sizes—5 h.p., $7\frac{1}{2}$ h.p., and 10 h.p. This grinder supersedes several items which have been discontinued. Each of the wheel guards, which are of steel plate, is now mounted on two heavy steel brackets, making the mounting as rigid and strong as the guard itself. The guards are adjustable. The steel grinding rests are heavier, and



Hisey Improved Floor Stand Grinder

are both adjustable and removable. The machine in all three sizes is equipped with a larger spindle and larger bearings than the machines formerly made, and all feed wires are encased in flexible metal conduit.

The 5 h.p. machine takes a wheel $18 \times 3 \times 1\frac{1}{2}$ in. hole; the wheel for the $7\frac{1}{2}$ h.p. machine is $20 \times 4 \times 1\frac{1}{2}$ in. hole, and the wheel for the 10 h.p. machine is $24 \times 4 \times 2\frac{1}{4}$. The height from floor to spindle is $34\frac{1}{2}$ in. on all three sizes, and the distance between wheel centers is 43 inches on the 5 h.p. machine and 44 in. on the $7\frac{1}{2}$ and 10 h.p. machines. Speeds run from 1140 r.p.m. for the 5 h.p. machine to 900 r.p.m. for the 10 h.p. machine. Net weights, from 1,650 to 2,000 pounds.

FOSDICK

High Speed Ball Bearing Sensitive Drill

—“Gangs” up to 6 Spindles—

**SENSITIVE
RIGID**

**ACCURATE
ADAPTABLE**

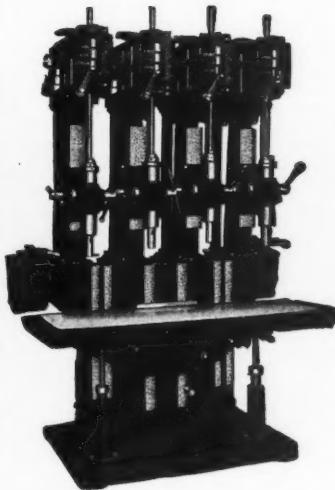
Ball Bearings on all revolving parts.

Spiral Gear Drive; hardened spiral gears running in oil.

Patented Belt Shifting Mechanism, using a central cam drum, controlled by crank.

Four-cone pulley gives four speeds. Range of three sets of speeds to choose from.

Channel for chips and lubricant around table.



Spindle of Chrome Nickel Steel, accurately ground.

Spindle Sleeve is supplied with one thrust and two radial ball bearings.

Head is adjustable and can be clamped in position.

Power Feed. Four geared feeds for each spindle. Feed-engaging clutch and all gears are enclosed.

Patented Tapping Attachment is clamped to quill or sleeve and is disc-driven.

Developments far ahead of general practice in building machines of this type are embodied in the design on this machine. Especially intended for use on the rapid, accurate drilling operations met in modern high-production manufacturing plants.

Ask For Specifications

THE FOSDICK MACHINE TOOL CO.
CINCINNATI, OHIO, U. S. A.

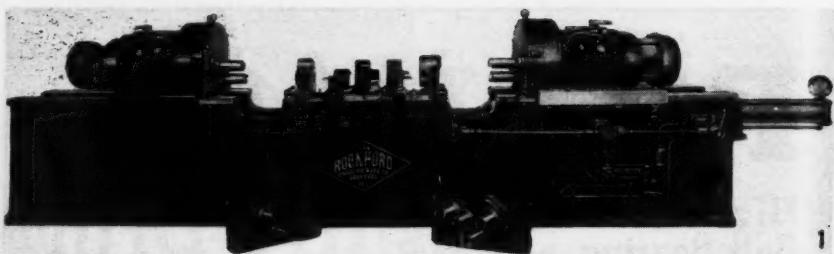


Fig. 1—Rockford Double-End Horizontal Drilling Machine Set Up for Drilling Crankcases

Improvements in Rockford Drilling Machines

A number of interesting improvements have been incorporated in the design of the more recent products of The Rockford Drilling Machine Co., 10 Catherine St., Rockford, Ill. In Fig. 1 is shown a Rockford Double-End Horizontal Drilling Machine with fixtures in place for core-drilling crank and cam lines in automotive crankcases. Two extra spindle-units are shown standing beside the machine. With the machine set up as shown, the user drills one type of crankcase on a high production basis, then he replaces the spindle units with those shown on the floor, also changing fixtures, and core-drills a case of a different type on a high production basis.

Figure 2 illustrates a vertical arrangement of a Rockford machine having a three-station indexing table for progressive operations on a tractor gear case housing. The first station is the loading station; at the second station the hole is bored through the hub and the hub is turned, faced and counterbored, and at the third station the hub is finish turned and bored while the large hole at the opposite end of the case is being rough and finish bored. The machining operations take place while the operator is unloading and reloading the jig at the first station.

Figure 3 shows a Rockford machine with a heavy duty three-way arrangement for boring the massive tractor transmission case shown on the floor, on a high production basis. The two end units of the machine rough and finish bore the two cross holes on either side of the case, one of which is $7\frac{1}{2}$ in. dia., and the other, 9 in. dia., while the third unit rough and finish bores the large end hole to $13\frac{1}{2}$ in. All holes are bored simultaneously and both rough and finish operations are completed in one pass of the machine heads.

The general constructional features of all three machines are the same. Each unit is motor-driven direct, through two sets of worms and worm-gears for reduction and through spur pick-off speed



Fig. 2—Vertical Type Machine With Three-Station Table

change gears located at the side of the unit. The machine will deliver two speeds for each set of gears by shifting the lever on the top of the head.



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WHEREVER there is a difficult machining job to be done there you will find Houghton's Refrigerant Base.

It was used in the machining of the Hispano-Suiza motors and Solex carburetor of the "Question Mark"—and it is being used with equal success the world over, wherever precision machining, production and economy go hand in hand.

Houghton's Refrigerant Base is a superior cutting oil concentrate which, when mixed with neutral or paraffin oil *in your plant*, produces a cutting medium which has the virtues of lard oil plus exceptional cooling properties. Refrigerant Base is also obtainable ready mixed with mineral oils ready for use. In this state it is known as Frapol.

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And All Over the World

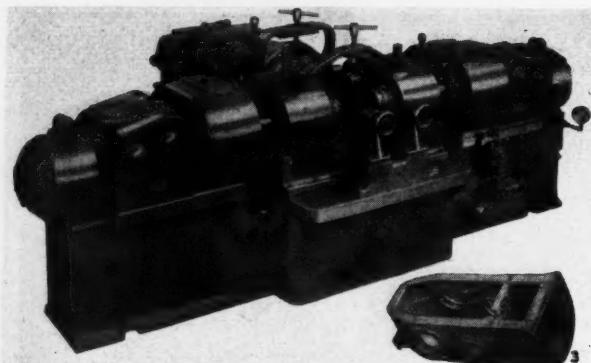
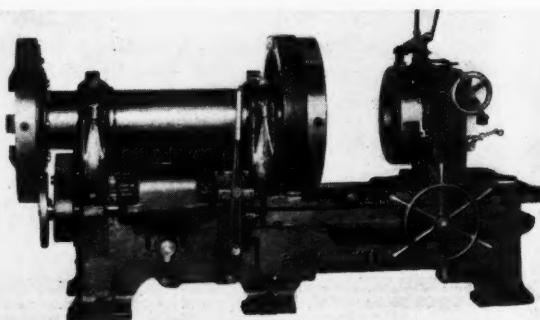


Fig. 3—Rockford Three-Way Machine For Boring Tractor Crankcase

All revolving parts in the drive heads proper are mounted in Timken Tapered Roller Bearings, and all working parts run in a bath of oil. The units are built up separately with the proper number of spindles in the correct locations and when the units are applied to the machine, they become an integral part of the machine. The feed on these machines is obtained through an Oilgear pump, and the necessary cylinders. Automatic rapid traverse combined with the desired feed is obtained with one movement of the lever, the unit slowing to any desired feed at any point in the operation and changing feed as each part of the operation is completed.

Bignall & Keeler No. 8 Duplex Pipe Threader

A machine designed to cut and thread pipe and casing from $2\frac{1}{2}$ in. to $8\frac{1}{4}$ in. diameter has been placed on the market by the Bignall & Keeler Machine Works, Edwardsville, Ill. The machine, known as the No. 8 Duplex, is equipped with a Peerless sliding die-head with expanding dies. Screw adjustment is provided for accurate setting of the dies, and a positive locking arrangement takes all strain from the adjusting screw in insuring duplicate threads. The heavy bed casting is strongly braced and contains the lower half of the gear-box.



Bignall & Keeler No. 8 Duplex Pipe Threader

Eight speed changes are provided through broad face steel-cut gears, running in oil in a compact gearbox. Quick stopping and starting is provided by a two-way positive clutch mounted on the bed-shaft. The clutch has both slow and fast positions, enabling the operator to shift quickly to the higher speeds for cutting-off large sizes of pipe. Power is transmitted to the revolving parts from below.

A three-jaw independent chuck is mounted on each end of the arbor, each jaw having a tempered tool steel gripper which can be readily removed for sharpening. The rear chuck has special flange grippers, which will be found convenient in making up flanged fittings. The machine is furnished with a geared oil pump which supplies a constant stream of oil to the tools. Self-centering V-jaws with hardened faces are provided for steadyng pipe when cutting off, reaming and beveling.

The die-head slides to one side for changing dies and when putting collars through to the cut-off tool. The head can be arranged for dies either $3\frac{1}{8}$ or $4\frac{1}{8}$ in. wide. The machine has ample power to cut long tapered threads to the A. P. I. or any other standard at one pass. Landies die-heads and dies can be substituted if desired. The machine can be equipped with motor for any available

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ATKINS Silver Steel Hack Saws
With Good Results—

Now Try ATKINS Silver Steel Files!

Many of the files of today are not very far ahead in quality and workmanship of those of 50 years ago—not so with "SILVER STEEL" Files.



From the great research and experimental laboratories of ATKINS comes the new "SILVER STEEL" File, pronounced by expert mechanics—
"THE FINEST ON EARTH."

Atkins Files actually make the mechanic's job an easier one with clean, deep bites into the metal he is working. Try them... You'll like them better.

Write us for literature and name of nearest distributor.

Send for File Chart and "Atkins Saws In the Shop"

E. C. Atkins and Company

"The Silver Steel Saw People"

Established 1857

Home Office and Factory: Indianapolis, Ind.

Canadian Factory: Hamilton, Ont.

Machine Knife Factory: Lancaster, N. Y.

Atlanta
Chicago

Memphis
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New York City
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Real Economy

For You!



When it comes to real economy . . . you can't beat the savings you get with the Midwest Core Drill...especially where accurate drilling is required.

This tool consists of a holder and core drill tip, so arranged that after the tip is worn out a new tip may be inserted without removing the holder from the machine.

Midwest Core Drills eliminate the necessity of replacing complete solid high speed core drills which are very expensive because they go undersize so quickly.

Write for a bulletin...it describes many more economy features of this tool.

MIDWEST TOOL & MFG. CO.

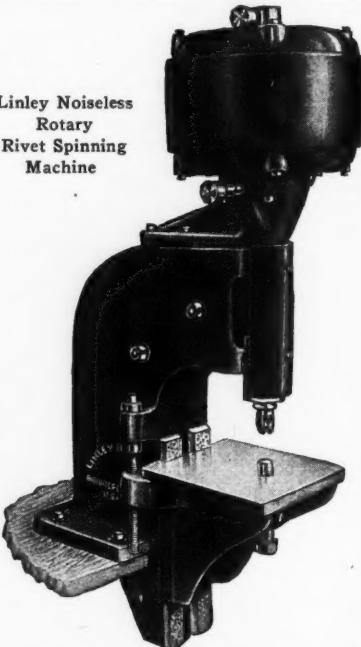
2362 W. JEFFERSON STREET
DETROIT :: MICHIGAN

current, or arranged for belt drive. Floor space required, 57 x 110 in. Hole through spindle, 10 in. diameter. Carriage travel, 20 in. Motor required for motor drive, 5 h. p. Weight, 7,500 pounds.

Linley Noiseless Rotary Rivet-Spinning Machine

A noiseless riveting machine with which rivets can be headed at a rate of from one to two seconds each, depending upon the size of the rivets, has been developed by Linley Brothers Company, 579 Fairfield Avenue, Bridgeport, Conn. The machine spins a highly-polished

Linley Noiseless
Rotary
Rivet Spinning
Machine



head on the rivet, operating absolutely without noise, and is claimed by the manufacturers to deliver higher production than can be obtained by any other type of riveting machine made. Rivet shanks are never bent on this machine. Iron or cold rolled steel rivets in sizes up to $\frac{1}{8}$ -in. diameter can be used in this machine, and brass, aluminum or other alloy rivets can be used in larger sizes, according to the hardness of the alloy. Tubular rivets are handled with the same facility as solid rivets. Exact uni-

Sheffield Jessop's ALLOY "C" STEEL

is the

**NON-ABRASIVE — NON-DEFORMING
HIGH PRODUCTION**

TOOL and DIE STEEL

universally in use because

1. It is supplied in a condition permitting of easy machining and filing.
2. It resists scaling on heating and corrosion under moist atmospheric conditions.
3. It hardens in either air or oil, and is non-changeable.
4. It retains cutting hardness after several regrinds.
5. Its resistance to abrasive wear is so great that it has been called the peer of high production steels.
6. Last but not least — it is made from the very best of base materials which Jessop's consider so necessary in the manufacture of all their tool steels.

A very interesting leaflet on this remarkable cutting and wearing steel has been prepared for you. Write any of our branches below.

William Jessop & Sons, Inc.

NEW YORK
121 Varick Street

BOSTON
163 High Street

CHICAGO
1857 Fulton Street

DETROIT
8116 Tireman Avenue

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No question about it—
A Giant for Strength—
A Brute for Abuse!

HEIGHTS 18", 20", 22", 24", 26",
28", 30", 32", 34", and 36", with
15" diameter steel seat. 6 x 14" steel
backrest riveted to adjustable spring
steel pillars. Same stool without back-
rest our No. 5DS.

Write for Catalog "C-MMS"

Angle Steel Stool Co.

"The Steel Equipment People"

PLAINWELL, MICHIGAN

Angle Steel and Sheet Metal Equipment

Shop Desks

Shop Benches

Shop Trucks

Shop Bench Legs

Tool Stands

Shop Chairs

formity can be obtained if the parts to be riveted are uniform.

The machine is of high-grade construction throughout, the materials being of the best. The spindle is of 3½ per cent chrome nickel steel, ground to size. Spindle-thrust is taken by a double-row radial thrust ball bearing of ample size, this bearing also carrying the radial load of the spindle at the lower end. The bearing casing is designed so that the spindle cannot throw oil on the operator. The spindle stroke is operated by a cam and lever mechanism which, with short tread travel, delivers unusual power throughout the entire stroke of the spindle. The direct connection between the motor and spindle eliminates the possibility of lost power and reduces the number of wearing parts to a minimum. The motor is mounted high, free from dust and dirt, and is almost entirely enclosed so that there is no possibility of accidents. Machines are furnished completely wired, and with starting switch or rheostat, which reduces installation costs to a low figure.

Federal "390" Dial Thickness Gage

The Federal Products Corporation, Providence, R. I., has brought out a dial



Federal "390" Dial Thickness Gage

thickness gage with the dial graduated to .0001 inch, for measuring all kinds of

Quieter, Smoother Machinery with **FORMICA!**

FORMICA gears are increasingly popular because quiet, smooth running machinery is popular.

Maintenance men find it helps them do their jobs better. Machinery salesmen find that devices equipped with Formica gears sell easier.

Good gear cutters in every leading city carry Formica in stock and can deliver replacement gears when a machine breaks down, very promptly.

Try Formica the next time you need a gear.

The FORMICA INSULATION COMPANY
4632 SPRING GROVE AVENUE CINCINNATI, OHIO



Eclipse HIGH
PRODUCTION
TOOLS

Die Sinking Cutters and End Mills



These ECLIPSE Tools surpass the ordinary type of tool in two important points. First, they *cut faster* and, second, they *last longer*.

ECLIPSE Die Sinking cutters and End Mills are made of high grade 18 per cent tungsten steel, correctly hardened and carefully inspected. Each tool is tested for hardness on the Rockwell Hardness tester.

Let us show you what these ECLIPSE High Production Tools will do in your shop. Send the coupon for a catalog.



This is No. 6 of a series of advertisements describing the ECLIPSE Line of high production tools. Watch for others to follow.

**ECLIPSE COUNTERBORE CO.
DETROIT MICH.**

ECLIPSE COUNTERBORE CO.

Detroit, Mich.

Please send me the ECLIPSE catalog.

Name.....

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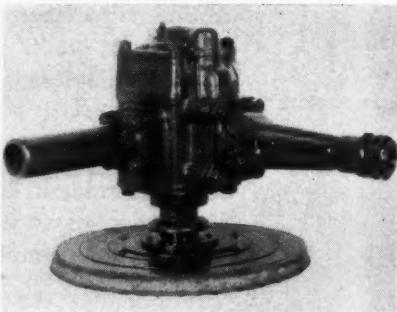
Address.....

City..... State.....

flat materials. Holes for the fingers are provided for convenience in using, and the lever by which the spindle is raised is convenient to the thumb. The tension spring can be adjusted to suit the user. The anvils are hardened and ground, with either flat or ball points. The depth of the throat is $\frac{3}{4}$ in. and the range of the spindle is .100 inch. The dial is easily read, as the .0001 in. graduations are as far apart on the dial as .001 in. graduations are on the ordinary indicator.

Thor Rotary Pneumatic Sander

The Independent Pneumatic Tool Co., 236 South Jefferson Street, Chicago, Ill., has placed on the market a pneumatic sander that is designed along the rotary principle. The tool, which is known as the No. 260-S, is of the center spindle type and is equipped with two handles, making it an exceptionally easy machine



Thor Rotary Pneumatic Sander

to handle. It is perfectly balanced, and operates without vibration.

A feature of the tool is the governor, which performs two functions. When the sander is operating at peak load, the governor automatically opens the throttle and admits as much air as is necessary to do the job efficiently. When the motor is running idle, the governor automatically decreases the air consumption, thus saving wear on the moving parts. This feature results in longer life for the tool, lower maintenance costs, and lower air consumption. The speed of the Thor No. 260-S is 4,500 r.p.m. Weight, less wheel or disk, 10 lb. Length overall, 8 in. Spindle thread, $\frac{5}{8}$ in. x 11 U. S. S.

Dynamic Balance

- vs -

Static Balance

THIS is not a new problem, but in the past, Static balance has usually won because sufficiently rapid Dynamic balancing equipment was not available to meet present production demands of low cost.

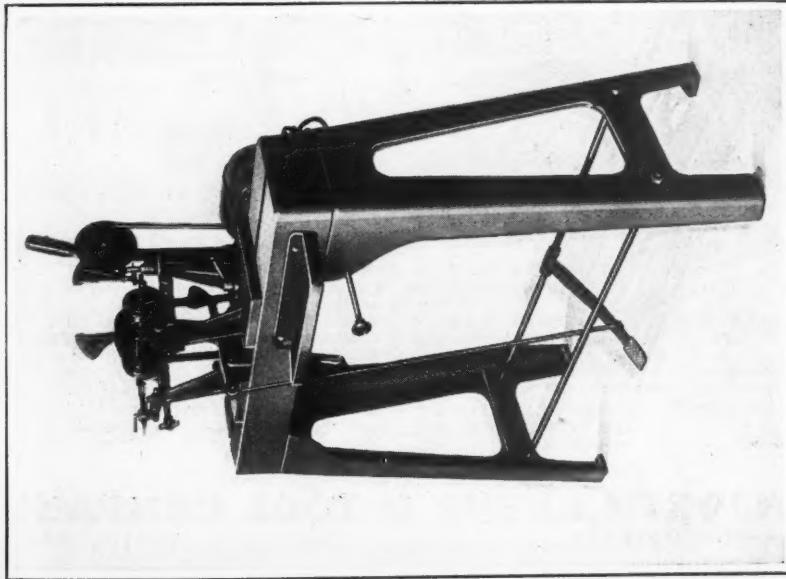
The price of our machine is but little more than good static equipment would cost. When you spend the cost of balancing, why not balance right?

Remember: If it isn't Dynamically balanced, it is not balanced.

Our machine balances diameters from one inch to twenty inches. They are now balancing Rotors, Armatures, Flywheels, Pump Impellers, Cranks, Shafts, Camshafts, Driveshafts, etc.

What is your problem? Write the

Globe Tool & Engineering Co.
DAYTON, OHIO



"Kold Prest Tubes"

Drawn metal tubing, of any diameter from 1 to 9 inches and of any length up to 10 feet, and with diameters held to limits of plus or minus .001 in. for the entire length of the tube, is now being manufactured by the Fulton Sylphon Company, Knoxville, Tenn. Wall thicknesses may be specified to range from .004 to .050 in. The inner and outer surfaces of the tubing, which is known as "Kold Prest Tubes," are very smooth. It is said that the tubing is produced by a new method so economical that the tubing will now be available for commercial purposes where a thinner-walled and more accurate tube is desired than the tubing previously available. The tubing is adaptable for use in the manufacture of flashlight cases, thermo bottle cases, laboratory uses where accuracy is desirable, aeronautical and navigation instruments, and so on, and can be supplied in brass, copper, zinc, ambrac, or aluminum.

Steelgrip Universal Gear and Wheel Puller

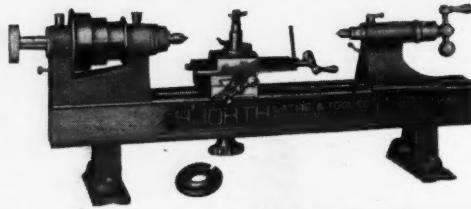
Large or small gears, wheels or pulleys can be pulled—even when they are some



Steelgrip Universal Gear
and Wheel Puller

distance from the ends of their shafts—by the use of the Steelgrip Universal Gear and Wheel Puller, which has been placed on the market by Armstrong-Bray & Co., 664 Eagle St., Chicago, Ill. The puller is easy to operate and can be used in awkward places.

The screw of the Steelgrip Puller is of chrome nickel steel with hardened point, and the chain is of the finest quality. The No. 3 Puller is equipped with three chains, each 3 ft. long, with which the workman is enabled to pull gears or

Hjorth Precision Bench Lathe

Lathe No. 4, as illustrated, \$185.00.
Countershaft \$26.00. Collets (each) \$3.00.

THE HJORTH Precision Bench Lathe is the product of thirty years' lathe-building experience. It is highly efficient for shops where accuracy, speed and durability are essential.

In the tool room and in the factory, for production and experimental purposes, it will handle light, medium

and heavy loads with equal ease. It is never idle. There are three sizes to meet various requirements.

No. 4—Collet capacity thru $\frac{5}{8}$ ".
No. 5—Collet capacity thru $\frac{7}{8}$ ".
No. 6—Collet capacity thru $1\frac{1}{4}$ ".

36" bed, 18" between centers, $8\frac{3}{8}$ " swing over ways.

WRITE FOR OUR CATALOG

HJORTH LATHE & TOOL COMPANY
24 SCHOOL STREET BOSTON, MASS.

**44 TAPPING OPERATIONS ELIMINATED
... on each Philco Balanced Unit Radio**

Use radio, see and you will appreciate the amount of work involved in fastening. Scores of fasteners are required to hold the radio together. These are usually tapped into the metal parts to reduce the time required to assemble and troubleshoot. Average factory companies spend a great deal of time in the production of these fasteners. The Philco Balanced Unit Radio has been designed to produce it. Economy and speed are the main objectives. So successful has it been that in short time 6,000,000 of these self-tapping screws have been sold. Every man concerned with the saving of time and labor should be interested.

With the machine screws to assure a good hold, it was decided that the best way to hold the radio together was to use self-tapping screws. These screws were far more secure than the washers used without impacting the strength of the connection. A number of tests were made to determine the best way to assemble the various parts being fastened on the chassis with the Self-tapping Screws but without using washers. These sets were placed on a vibrating machine and subjected to severe vibration. Then the sets were removed and the fasteners were carefully checked. It was found that the screws held just as well as the washers. This was considered to be a great success.

Widely used in **Radio Industry**

These unique screws are responsible for greatest production speed and economy in many other radio receivers and wireless radio sets and receivers. Other leaders in the industry who assemble their equipment with these screws include Stromberg-Carlson, Zenith, Colgate, Edison, Crosley, General Motors, Radio, Zenith, Colgate, Edison, Crosley, Zenith and Victor.

Free!
to plant
executives

Fastenings
How they are
made by leaders in
the metal working
industries

"Every Man concerned with production should read it"

... says a prominent production engineer

Any man concerned with the production of a product made wholly or partly of metal will find this new booklet, "Fastenings—How they are made by leaders in the metal working industries," most interesting reading. The chances are, too, that he will obtain from it information of considerable value to his own work.

This booklet contains accurate descriptions of the ways in which greater fastening economy has been attained on the Servel Refrigerator, Philco

Radio, Hotpoint Range, Ford Tri-motor Plane, Simmons Metal Furniture, Zenith-Detroit Carburetor and other well known products. All of the facts and figures given, were secured through fastening studies made by independent engineers in the plants of fourteen of the most prominent concerns in their respective fields.

"Fastenings" will be sent free of cost or obligation to any plant executive. It is only necessary to fill in the coupon and attach it to your letterhead.

PARKER-KALON Hardened Self-tapping Screws

PARKER-KALON CORPORATION
Dept. E, 192-196 Varick St., New York, N. Y.

Send a free copy of "Fastenings" marked to the personal attention of:

Name and Title.....

Company.....

Street and City.....

CONNECTICUT BROACHES

*for better
RESULTS!*

When you use a Connecticut combination round and spline broach you are assured of great savings in time, reductions in tool costs, and a more accurate job. These results are positive because this tool broaches the drilled hole to size, cuts the splines and removes the burrs *in one operation*.

You cannot afford to overlook these possibilities in your plant. Send us a description of your work and we'll recommend a broach that is guaranteed to give you better results!

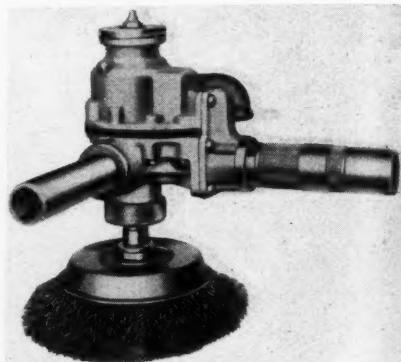
**The CONNECTICUT
BROACH & MACHINE CO.**
NEW LONDON, CONN.



wheels approximately 3 feet from the ends of the shafts. The pulling power of this tool is approximately 4 tons. The No. 4 Heavy Duty Steelgrip Puller, which is intended for large, heavy work, is equipped with three chains each 5 ft. long and has a pulling power of well over 12 tons.

Rotor "B-O" Air Tool

The Rotor Air Tool Co., 5704 Carnegie Ave., Cleveland, Ohio, has brought out an air-operated tool which can be adapted to a number of uses. The tool is furnished to operate at either of three



Rotor "B-O" Air Tool

speeds—1,000, 1,500, or 2,000 r.p.m. and is very light, weighing only 6 pounds. It can be used for drilling in close quarters or where there is small clearance, and will operate drills up to $\frac{1}{8}$ in. It can also be used for nut-setting for nuts up to $\frac{1}{2}$ in., and with the proper attachments and tools can be used for rubbing and polishing lacquers, for wire brushing to remove scale from all kinds of metal parts, for finishing stone or surfacing concrete, or for other similar operations. Drill chucks, grinding wheels, buffers, sanders, and other attachments can be supplied as special equipment.

Kearney & Trecker Positive-Lock Face-Milling Cutters

A line of positive-lock face-milling cutters of the inserted-blade type has been developed by the Kearney & Trecker Corporation, Milwaukee, Wis., for use in connection with production and general-purpose milling. The design of these cutters embodies several novel features

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How Many Parts of YOUR Product Could be Made of **PRESSED STEEL!**



vantages of pressed steel... both in quality and in reduced costs. Consequently, pressed steel parts are making their appearance in all sorts of products... even in heavy machine tools... and they are proving better than castings.

What about your product? One or two of its parts made of pressed steel may bring you appreciable savings in weight, material, machining and labor.

Find out! Let Metal Specialty Engineers show you what can be done... send your parts list... there is no obligation and it may be the means of saving you thousands of dollars!

THE METAL SPECIALTY CO.
1530 SIXTH STREET, WEST CINCINNATI, OHIO



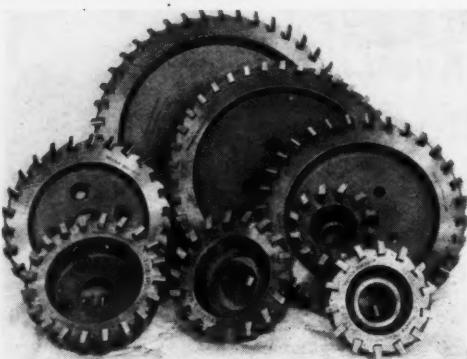


Fig. 1—K. & T. Positive-Lock Face-Milling Cutters

which make the cutters particularly adapted for accurate milling operations. The cutters are intended primarily for medium roughing cuts and finishing operations, rather than for heavy hogging purposes. The blades are so spaced that the cutters are also suited for the milling of surfaces made up of thin, narrow sections. The illustration shows a group of these face-milling cutters in sizes

ranging from 5 in. to 16 in. diameter.

Two distinct styles of cutters are offered, one of which is equipped with high speed steel blades and the other with Stellite. The only difference in the two styles is in the angular mountings of the blades. These angles have been carefully developed to suit each of the respective cutting materials, so that the highest cutting efficiency and longest life between grinds will be obtained. The spacing of the blades for both styles is such that ample chip clearance is provided at various speeds, feeds, and depths of cut. The cutters can also be supplied with blades tipped with cemented-tungsten carbide, as the design

of the cutters provides the characteristics so necessary in a milling cutter using this alloy.

The mounting of the blades, as illustrated in Fig. 2, is arranged so that a positive lock is attained by means of a hardened and ground tapered wedge, thus eliminating the possibility of any of the blades working loose while operating. The front side of the blade is

HOB YOUR SMALL PINIONS, GEARS, RATCHET WHEELS, ETC.

ON OUR

KOEPFER

Full Automatic Hobbing Machine

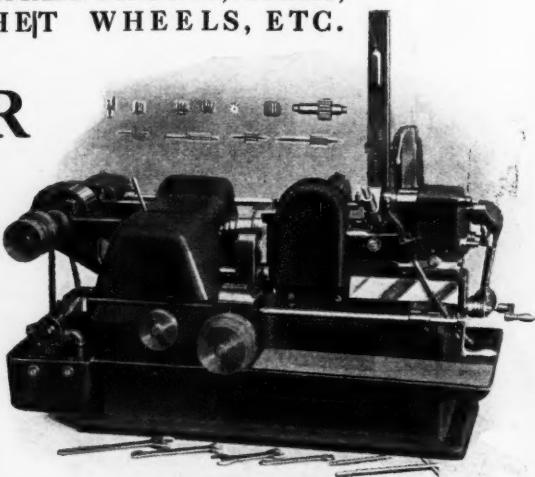
THIS machine has a fully automatic cycle of operation and on pinions is equipped with a MAGAZINE loading attachment.

The HOBBING process generates a theoretically correct tooth form and indexes the teeth uniformly accurate. It results in better work of greater PRECISION as well as greatly increased production.

Ask for Catalog WMII

GEO. SCHERR CO.,

142 LIBERTY STREET
NEW YORK CITY, N. Y.



HIGH SPEED • Multiple Drilling

5500 RPM

13 SPINDLES

1/4" MINIMUM CENTERS

INDEX announces another high standard of production, this time in multiple drilling of small holes . . . 5,500 r. p. m., . . . one to thirteen adjustable spindles . . . $\frac{1}{4}$ " minimum centers . . . $\frac{1}{8}$ " chuck capacity . . . a new facility of spindle set-up . . . hand lever or foot treadle operation . . . *motor in head* . . . with coolant pump electric driven by separate motor.

Range of work of the Boley HI-SPEED Multiple Drill includes production on cash registers, adding machines, radios, clocks, meters, automotive parts, locks, etc., etc., and it is efficient in metals, bakelite, micarta, formica, rubber, wood and other materials or compositions.

5,500 r. p. m.! Just the machine you have been looking for.

OTHER SPECIFICATIONS

Minimum center distance between holes, $\frac{1}{4}$ "; Drill table 7" x 10"; Table lift, hand $2\frac{1}{4}$ ", foot $1\frac{1}{8}$ "; Maximum distance between table and collet, 12"; Frame area, circular $5\frac{3}{4}$ ", rectangular 9" x $5\frac{1}{4}$ ". May be furnished for bench mounting if desired.

Write for further data
and prices



INDEX
MACHINERY CORPORATION
CINCINNATI OHIO

3 Siewek Tools SERVING INDUSTRY WELL

To serve industry well, a tool must save time...energy...or money. Siewek Tools make these savings. Take for instance:

Siewek Drill Jigs

The cushion clamping of these jigs saves energy, loading time, allows closer accuracy, and increases production. They are built in nine sizes.



Siewek Fixture Locks

These locks ave production costs by re-



ducing spoiled work. The quick, positive action insures a strong grip that holds work immovable, eliminating danger of shifting under cut. There are nine sizes.

Siewek Drill Heads

When used with Siewek Drill Jigs, these heads insure a set-up that will save time and increase production. There is a Siewek Drill head for every need.

WRITE FOR A CATALOG

Siewek Tool Co.
10232 Woodward Ave., Detroit, Mich.



ground to a taper that corresponds to the contacting face of the wedge. With a screw holding each blade, there is no danger of the blades lifting out of place even though the wedge should loosen. Assurance against end slippage is attained by the use of a set of small pins, one of which is mounted in each slot of

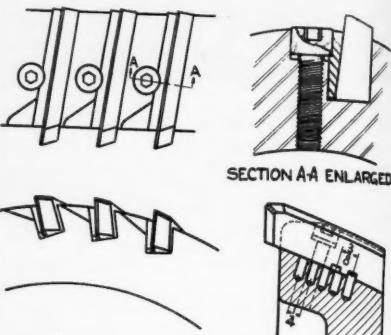


Fig. 2—Method of Holding Blades

the cutter-body and which fits into one of the grooves at the bottom edge of the blade. This construction offers a positive end support for the blade and prevents the blade from slipping under pressure of a heavy cut. The five holes in each of the slots in the body are $\frac{1}{4}$ -in. apart, and the two slots in the blade are $\frac{3}{8}$ -in. apart, allowing the blades to be adjusted outward in increments of $\frac{1}{8}$ -in. as the blades become worn.

The bodies of these cutters are of

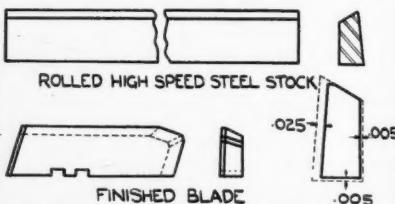
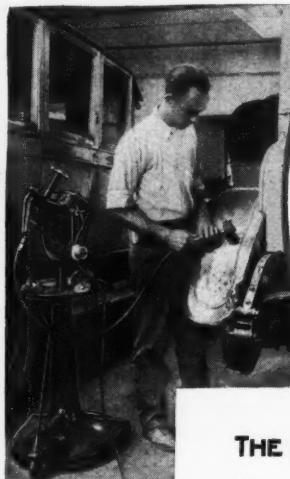


Fig. 3—Detail of Blade Construction

chrome nickel steel forgings, heat-treated after roughing machining. The bodies are cone-shaped so that the blades are positioned at an angle to the body, allowing a uniform outside diameter to be maintained as the blades become worn. This uniformity is maintained by adjusting the blades outward and then grinding to suit.

In Fig. 3 is shown the shape of the



THE KELLERFLEX

KME KELLER MECHANICAL ENGINEERING CORP.
84 Front Street Brooklyn, N. Y.
Stock at Chicago and Brooklyn office

A Custom Built Flexible Shaft Machine at Quantity Cost!

Originally, we designed and built the *Kellerflex* machine to meet our own exacting needs. So superior was its performance in our own shop, over any other available tool of this type, that we decided to make the *Kellerflex* available to any other manufacturers who were confronted with flexible shaft tool problems.

We believe that there is no other flexible shaft machine on the market that gives so many days of satisfactory service on the many jobs of grinding, burring, wire brushing, buffing, snagging, etc., as does the *Kellerflex*.

AMERICAN V-2 Broaching Machine

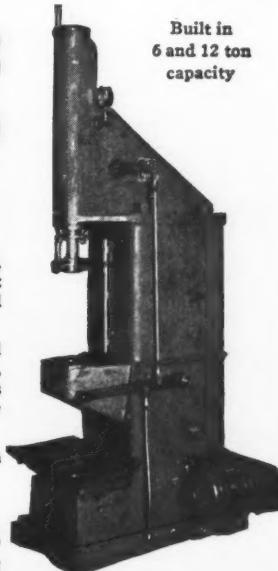
**SMOOTH - POWERFUL
ACCURATE - PRICED RIGHT**

HYDRAULIC PRESSURE is smooth acting, positive, and powerful—the ideal for accurate broaching. That is why the American V-2 Broaching Machine is equipped with hydraulic feed.

It gives the ram a steady, smooth, downward stroke, and at a speed of 20 feet per minute has enough reserve power, up to 6 tons, to complete the stroke at this speed. As soon as the stroke is completed the ram automatically returns to the starting position.

This feature and many others are completely described in our bulletin—write for it TODAY!

The American Broach & Machine Co.
ANN ARBOR MICHIGAN



high speed steel bars before they are made into blades. A finished blade is shown at the lower left. Stellite blades are individually cast and are furnished ready for use. The blades are made interchangeable and will fit any size of body, which eliminates the necessity for carrying several sizes of blades in stock for bodies of different diameters. The cutters are made in 14 sizes, from 5 to 24 inches in diameter.



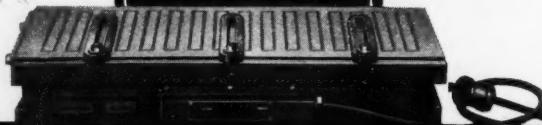
Clark Trucwelder

The Clark Tructractor Co., Battle Creek, Michigan, is now marketing a complete, mobile, self-contained, gas-powered, electric arc welding unit, called the Clark Trucwelder. The Trucwelder is capable of 24 hours' continuous operation, and is especially useful in places and on work where there is no convenient source of electric power. The Trucwelder takes the welding equipment to the work. The sturdy, compact, self-propelled outfit re-

duces time and distance, eliminates waste time in moving from job to job, and increases welding time. A high level of working capacity per unit and output per day can be maintained at a low cost per weld.

The unit is equipped with self-starter and headlights, carries all necessary welding accessories (General Electric standard), has ample room for acetylene tanks (for cutting), seating room for crew, and ample power for towing trailers. Arc welding current, ranging from

1. It has greater magnetic holding power than any chuck of equivalent size.
2. It is absolutely water-proof.
3. It possesses a wider magnetic working surface.
4. The magnetic flux density is heavier, permitting a great variety of set-ups.
5. Super Power construction throughout is rugged—for heavy duty.
6. It is electrically correct.



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Taper Test.
Special.

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The Taft-Peirce Manufacturing Company

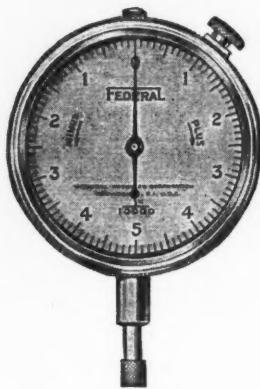
WOONSOCKET



RHODE ISLAND, U.S.A.

Tool Room
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Clearly Magnifies All Inaccuracies!

FEDERAL Dial Gauges enable you to gauge your work to closer accuracy than ever before. Limits of .0001" can be measured with the FEDERAL as easily as .001" with most other gauges.

And, in a FEDERAL you get a gauge that is built for service. Jeweled bearings, solid bronze alloy die cast case with integral stem, watch movement construction in self-contained unit, chromium-plated rack . . . these are a few of the FEDERAL features which make this gauge the best that you can buy.

Send for a Catalog . . . it describes a FEDERAL Gauge for every requirement!

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PROVIDENCE, RHODE ISLAND

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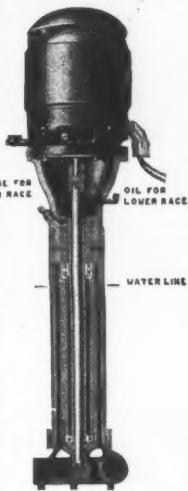
BROWNIE COOLANT PUMP

THIS efficient Coolant Pump is unusually economical for centerless grinders, as well as other machines. A centrifugal pump, it has no packings and will not clog. There is no bottom or pan under impeller to collect grit or chips. Drive shaft, impeller and protector tube are one unit, revolving together. With intake at the top, coolant is never forced upward between housing and protector tube, and never comes in contact with ball bearings (the latter being entirely self-aligning).

No. 1—Capacity, 50 gallons per minute. Maximum lift, 15 feet. $\frac{1}{2}$ h.p. motor. No. 2—Capacity, 15 gallons per minute. Maximum lift, 10 feet. $\frac{1}{4}$ h.p. motor.

Handles a heavy mixture of coolant with grit and chips as efficiently as it does clean oil. Furnished with or without motor, or with drive pulley if desired. Also furnished in Acid-resisting Metal.

*Write for prices and literature.
Use coupon.*



THE TOMKINS-JOHNSON CO.
JACKSON, MICHIGAN

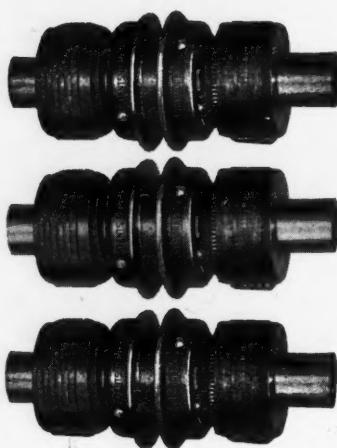
Please send data on:

- Coolant Pumps
- Arbor Presses
- Chucks—Air-operated—2- and 3-jaw
- Chucks—Collet
- Cylinders — Non-rotating, Tubular-type, Air-operated.
- Cylinders — Rotating, Double-acting, Air-operated
- Cutters—Die Sinking, Milling
- End Mills

Name

Address

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The
PULLMORE
 Industrial Clutch
 EFFICIENT
 COMPACT :: ADAPTABLE

SEND COUPON

In addition to sending you full descriptive matter on this new and most efficient clutch, if you will send us details of any installation you may have in mind, our engineering department will be glad to submit their recommendation applying directly thereto, gratis.

Rockford Drilling Machine Co.
 10 KATHERINE STREET
 ROCKFORD ILLINOIS

Rockford Drilling Machine Co.
 Rockford, Illinois

Send me a copy of the PULLMORE Industrial CLUTCH Catalog.

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Address _____

MMS-11

60 to 250 amperes, at 25 volts, is developed by a self-excited G. E. arc welding generator with control, driven by a special heavy duty, 4-cylinder gas engine developing 20 h.p. at 1480 R.P.M. Currents between 25 and 60 amperes may also be obtained by inserting in the circuit a current-reducing resistor provided for the purpose. The current available is ample for use with all commercial sizes of metallic electrodes from $\frac{1}{16}$ -in. to $\frac{1}{8}$ -in. also for light carbon welding or cutting.

The engine and generator are connected by a 3-in. endless special composition belt. The generator is thrown in and released by a hand-controlled belt tightener—a ball bearing idler mounted on sliding ways, located on the driver's platform at the right of the driver.

Automatic stabilizing of the welding arc is provided for by a self-adjusting arc stabilizing reactor. The reactor makes it easy for the operator to maintain a steady arc on low as well as on high currents, under all welding conditions. For striking the arc, a high open circuit voltage of 65 volts is available, after which the voltage is automatically reduced to that required to maintain the arc. Adjustments in the range of welding current, from 60 to 250 amperes, are made by simply shifting the generator brushes by means of an external handle. Further adjustment down to 25 amperes is made by an easy shift of electrode leads. The Trucwelder conforms to the specifications of the U. S. Bureau of Standards, meets the requirements of the U. S. Navy Department for arc welders, and is listed as standard by the Underwriters Laboratories.

Mathews Heavy Duty Roller Conveyor

A heavy duty roller conveyor especially designed for use in machine shops, foundries, and other plants where unusually heavy service is encountered has been developed by the Mathews Conveyor Company, 140 Tenth Street, Ellwood City, Pa. The conveyor is similar to the usual Mathews product, using frames of angle or channel iron and rollers of steel tubing with solid axles, but this unit is said to incorporate features not previously found in industrial roller conveyor construction.

One of the features of the unit is a gearlock which is made possible through gear teeth on the inside of the bearing cone and knurling on the axle of the conveyor roller. The contact of the teeth



NIELSEN LIVE CENTERS

Improve Lathe Accuracy!

Equip your tailstocks with Nielsen Ball Bearing Lathe Centers...they improve the accuracy of your lathe and allow you to work to closer limits. The long spindle and bearing arrangement keeps the center-point in perfect alignment, eliminating all

danger of the work wobbling while under cut.

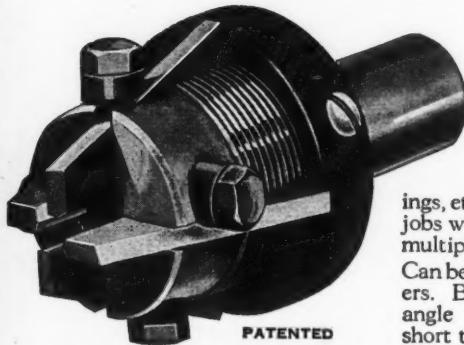
Thus, you can increase production, save time, and cut costs by using Nielsen Live Centers. There's a Nielsen Center for every need, too...write for a bulletin!

NIELSEN, INC.
LAWTON, MICHIGAN

Foreign Representative: Gaston E. Marbaix, Ltd., Adelaide House, King William Street, London, E. C. 4.

Genesee Adjustable Hollow Mill

Made in 7 different styles



Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

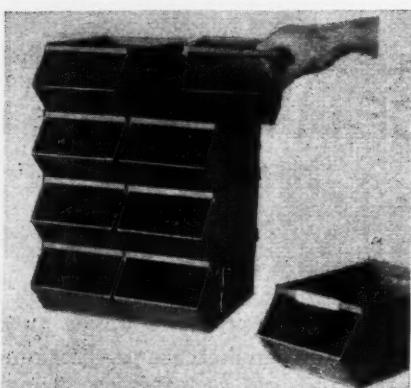
Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

WRITE FOR CATALOGUE

GENESEE MANUFACTURING CO., Inc.

ROCHESTER, NEW YORK



ALREADY SAVING THEIR COST MANY TIMES OVER

This new Bin is already reducing handling costs in hundreds of manufacturing plants.

Can be used in various ways in any plant with a saving of time, as well as space.

For instance, on the assembly bench, these Bins make it possible to place more parts within convenient reach of the assembler, enabling him to do more work with less effort.

Ideal for stockroom or toolcrib.

Made in four standard sizes, but can be furnished in sizes to meet your particular needs.

Bin No.	Width	Height	Length
1	5½ in.	4 in.	12 in.
2	7½ in.	5½ in.	15 in.
3	9 in.	6½ in.	18½ in.
4	12 in.	9½ in.	20 in.

New Simplex Nesting Bin

SIMPLEX TOOL CO., Woonsocket, R. I.

Kindly send descriptive circular and quote prices on Simplex Nesting Bins.

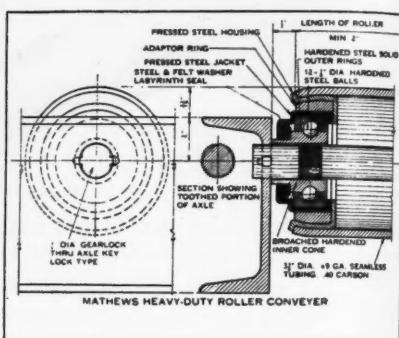
Name.....

Title.....

Firm.....

Address.....

with the knurling on the axle provides an effective lock to prevent the cone from turning on the axle. The possibility of the roller becoming clogged is eliminated through special steel and felt washer labyrinth which exclude dust and dirt



Drawing showing design of Mathews Conveyor Roller

from the bearings. These bearings can be packed with grease or furnished with fittings for grease gun lubrication if especially heavy duty is anticipated.

Another outstanding feature is the unusual keylock axle. One end of the axle is provided with an upset key which fits into a corresponding slot in the frame rail and thus prevents the axle from turning. The opposite end of the axle has a standard cotter key lock. The axle can, however, easily be removed from the frame.

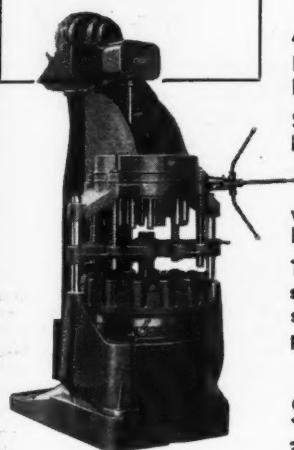
The frame of the conveyor is of angle or channel iron of sufficient size and weight to suit the material to be conveyed. Cross-bracings are arc-welded, providing a permanent frame that cannot work out of line. The rollers are of No. 7 gauge .40 carbon seamless steel tubing of 2 1/8-in. diameter, No. 9 gauge .40 carbon seamless steel tubing of 3 1/8-in. diameter, or seamless steel tubing

A Good Tool Chest



is essential for best results from good tools. It keeps tools safe from harm, makes work easier. Particular men are real proud to own a Gersner Chest. Catalog free.

H. GERSNER & SONS
1283 Columbia St., Dayton, O.



Snyder Tools Save Investment!

A PUMP MANUFACTURER needed equipment for machining the gear pockets and shaft holes of a pump body, and for drilling and countersinking the cover screw holes.

Snyder engineers solved his problem by equipping a well-known drilling machine used in his shop with a complete Tool Set-Up consisting of a Snyder twenty-three spindle ball bearing head, bushing plate, fourteen-station work holding fixture, ball bearing index plate and special box table.

That's an idea for your shop! Let Snyder engineers equip some of your comparatively obsolete equipment with Snyder set-ups and put it back in service as a modern high production machine!

WRITE FOR DETAILS!

Snyder Tool & Engineering Company
3400 EAST LAFAYETTE AVENUE, DETROIT, MICHIGAN

Low Cost Threading

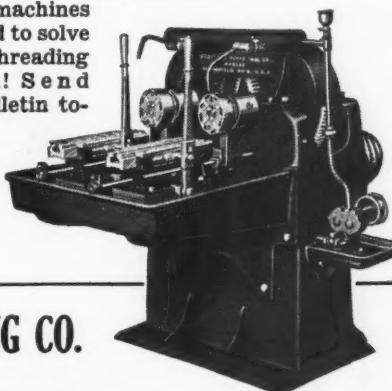
THE best way to reduce threading costs is to combine speed and accuracy in your threading operations. That is exactly what you get in "W & P" threading machines — combined speed and accuracy!

On the two spindle "W & P" die type thread cutting machine illustrated you can cut five hundred and fifty $\frac{1}{8}$ " U.S.S. threads, standard screw length, per hour—and

every thread will be accurate.

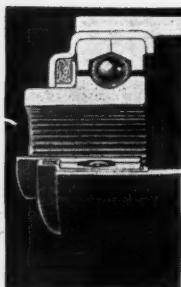
Investigate these tools—there are models for tapping also—they may be the very machines you need to solve your threading problem! Send for bulletin today!

"W & P"
Threading Machines
are built by
Mitchell Engineering.



THE MITCHELL ENGINEERING CO.

SPRINGFIELD, OHIO

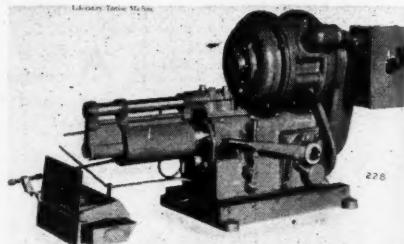


Sectional view of Mathews Heavy Duty Roller Bearing have continuous load capacity of from 600 to 2,000 lb., according to construction.

with $\frac{1}{8}$ -in. wall and of $3\frac{1}{8}$ -in. diameter. The ends of the rollers carry the ball bearings and labyrinth seals, the sizes of the balls being determined by the task to be performed. Axles are of $\frac{3}{8}$ -in. or $1\frac{3}{16}$ -in. diameter cold rolled steel with ends notched or with upset key lock to provide lock in frame rails. The rollers

is used to drill a 1-in. hole 1 inch deep in each test bar. The following cycle of operations is performed automatically:

Drill advanced in rapid traverse with chip collector cover closed; drill slows



228

Bradford Automatic Drill Head

Bradford Automatic Drill Head Adapted for Laboratory Testing Machine

The illustration shows a Bradford Automatic Drill Head which was recently developed for a large steel corporation, to be used by them in their chemical laboratory for the purpose of obtaining chips for chemical analysis. The head

down for feeding stroke and penetrates $\frac{1}{2}$ in. to remove all scale and dirt from test bar: drill returns in rapid traverse for $\frac{1}{8}$ in. and air jet removes all dirt and chips from hole and collector box cover: drill advances $\frac{1}{8}$ in. in rapid traverse, air jet is cut off and collector box cover opens: drill automatically slows down for feed stroke, penetrating 1 inch: drill returns in rapid traverse to starting point and collector box cover closes.

WHITON LATHE CHUCKS

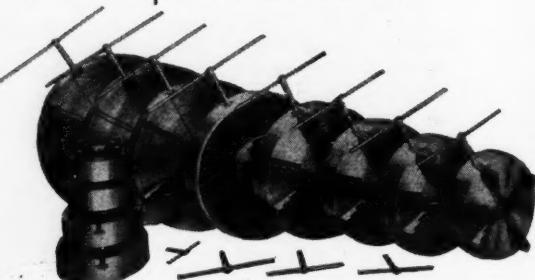
For
a Sure Grip!

WHEN work must be held rigidly and securely for accurate machining at top speeds—WHITON Lathe Chucks prove their superiority!

WHITON Chucks—and there's one for every requirement—are good chucks. Their design and workmanship assure you dependable service over a long period of time.

Get a WHITON Catalog—it shows the complete line of WHITON Chucks as well as many special chucks built for special requirements.

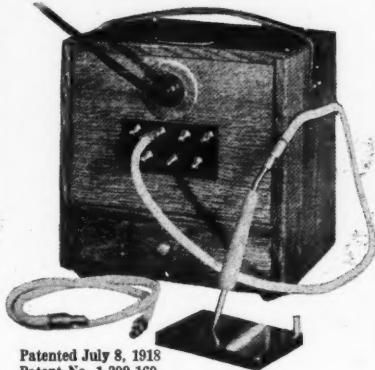
Here is a group of WHITON Steel Body Independent Chucks designed to hold heavy work under heavy cuts at high speed. The one-piece body resists sudden strain.



THE D. E. WHITON
MACHINE CO.
NEW LONDON CONN.

Etchograph

Trade Mark



Patented July 8, 1918
Patent No. 1,309,160

For Marking Tools or Parts

NOTHING can equal the original ETCHOGRAPH. Six stages of heat—no other machine has this feature—give a wide variation in the size of marking. Simple operation—write as you would with a pencil. Just plug in on any light circuit—mark any material—iron, steel or steelite. If tool marking alone is desired, the JUNIOR ETCHOGRAPH with two heats only will do your work.

Write for quotation, stating
power available.

**William Brewster
Company**

52 CHURCH STREET NEW YORK

Needs No Key



**No Fumbling
No Lost Time**

**Boker Chucks Grip
Like a Vise
Ball Bearing
Concentric
Simple Construction
Only 3 Units**

H. BOKER CO., Inc.
103 Duane St., New York, N. Y.
Send particulars, 30 days free
trial.

Name _____

Firm _____

Address _____

City _____ **State** _____

Ex-Cell-O Diamond Boring Machine

A precision diamond boring machine that can be adapted to the many and various tasks of modern production has been developed by the Ex-Cell-O Aircraft & Tool Corporation, 1250 Oakman Blvd., Detroit, Michigan. The design of the machine is such that, on the same machine, at a single loading and with a single fixture, both rough and finish bor-

anchored to the end walls of the base. The piston rods are tubular and the oil intake and outlet are provided by ports in the piston proper.

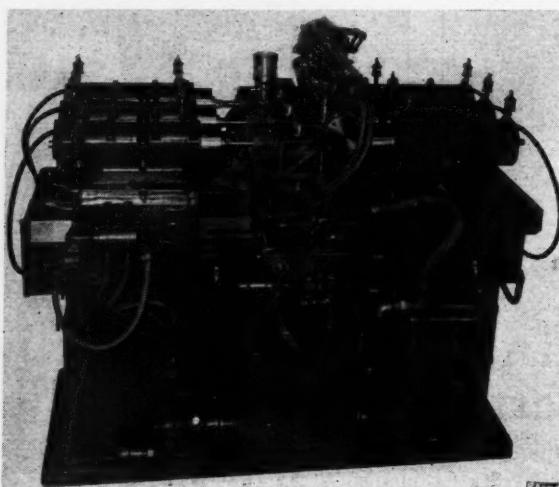
At both ends and cast integral with the base are heavy side rails which act as spindle bridge supports, one rail being flat and the other Vee. The legs of the spindle bridge are finished to conform to these ways and the bridges have a liberal amount of end adjustment so that they may be set to fit the individual job.

After positioning, the bridges are bolted solidly to the rails. The Vee construction on one side of the bridge makes it possible to re-set the bridges without disturbing the alignment of the spindle and fixtures.

The bridges upon which the boring heads are mounted are of the "U" construction and span the machine table. Provision is made for bolting the boring spindle units rigidly in place, also for all necessary adjustments. Each unit is mounted so that perfect alignment is assured when clamping in position. Each boring spindle is equipped with an individual built-in motor, rated at $\frac{1}{4}$ h.p., 3,600 r.p.m. Thus spare spindles with boring tools set to size may be inter-

changed with a minimum of lost time.

There are no belts, chains or gears in the entire machine other than those in the oil and coolant pumps, which are direct motor driven by a 2 h.p. fully-enclosed motor. The oil pump is full ball bearing with spiral gears and was especially designed for this type of machine. The coolant pump is of similar design. The entire lubrication of the machine is furnished by the hydraulic unit of the machine proper. The machine is fully hydraulic, operating under a pressure of 100 lb. per sq. in. Any speeds desired can be obtained, the adjustment being extremely simple and accurate. The entire operation of the machine is controlled from a valve located convenient to the operator's position. The base of the machine is supported at three points. The weight of the complete machine is 6,800 lb. and the floor space required is 14 square feet.

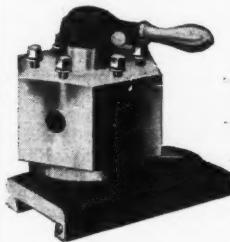


Ex-Cell-O Diamond Boring Machine

ing may be accomplished. In addition to reducing the amount of equipment and labor to the minimum, this feature makes it possible to leave a minimum amount of stock for finish.

The base of the machine is a single heavy casting, heavily ribbed, and enclosing both oil and coolant compartments. The ways have large bearing surfaces, one Vee and the other flat. The table is of heavy construction with a finished fixture pad of 20 x 25 in., carrying T-slots for bolting fixtures in place, in the center of the table. The table has a minimum stroke of 16 in. and the finished ways of the table are of such length that they never uncover the ways of the base during the operating cycle. The feed cylinder is clamped to the bottom of the table and is placed as closely as possible to the Vee way to insure a minimum of side tension and wear. The cylinder contains a double-end piston rod, both ends of which are

**STANDARDIZED
LATHE TURRETS**



STYLE "B"

Hexagon head, for round shank tools and bolted on fixtures.

8 Styles

12 Sizes

For any
make or
size of
Lathe, old
or new.

Ask for Circular No. 18

FAY & SCOTT

DEXTER, MAINE

DRILL

VICE

With and Without Jig Attachments

3 sizes, 6", 9" and 12" jaws

Fig. 2. Without
Jig Attachments

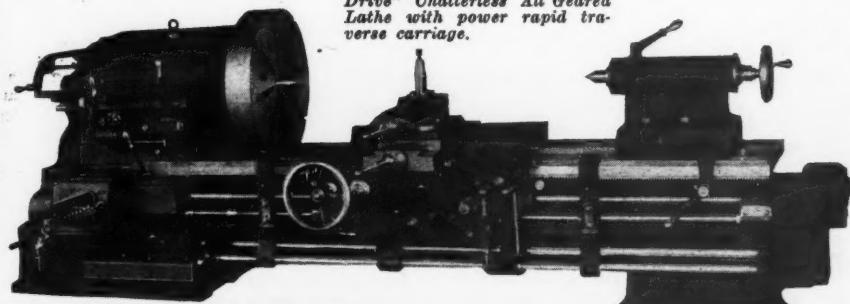
A good one for general shop use on Drill-
er, Miller, Shaper or Planer. Flanged all
around bottom for bolting down, with
three slots at large end not shown.

ANY VISE WILL PAY

THE GRAHAM MFG. CO.

69 Willard Avenue Providence, R. I.

B R A D F O R D 30-inch "Lo-
Drive" Chatterless All Geared
Lathe with power rapid tra-
verse carriage.



Here's a sample of...

BRADFORD PERFORMANCE!

THE following test, made on the BRADFORD lathe shown above, illustrates the kind of service you get from these tools.

A bar of 60 carbon steel, 8" diameter, was placed in this lathe and run at a speed of 75 surface feet per minute. The feed used

was $1/32"$ and the depth of cut $1\frac{1}{4}"$. The result obtained was a smooth finish absolutely free of all chatter marks.

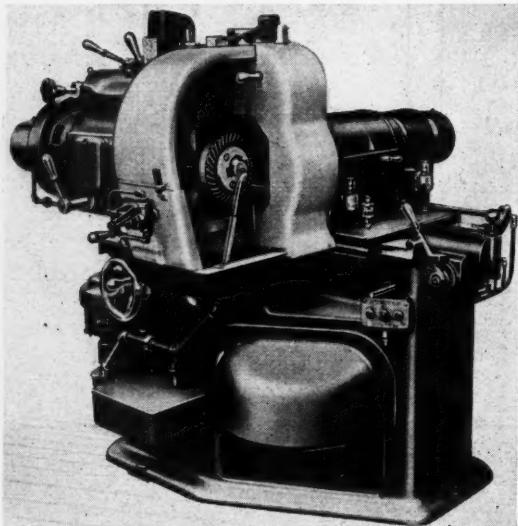
BRADFORD Lathes give chatterless performance on all cuts—even heavy intermittent cuts. Get the whole story—send for a catalog!

BRADFORD MACHINE TOOL CO.

659 EVANS STREET
CINCINNATI, OHIO

Gleason 18-In. Hydraulically-Operated Testing and Lapping Machine

A hydraulically-operated machine for lapping both spiral, bevel and hypoid gears in production quantities has been



Gleason 18-in. Hydraulic Lapping and Testing Machine

placed on the market by Gleason Works, 1002 University Avenue, Rochester, N. Y. The machine will handle any size of gear commonly used in the final drive of automobiles, omnibuses, tractors, or trucks. Any roughness or minor changes caused by the heat treatment or hardening operations are smoothed out and corrected by the use of this machine.

In lapping, the gear and pinion are run

together under load with a mixture of abrasive and oil. The pinion drives the gear and as the two rotate, the position of the gear is changed continuously to effect a combined horizontal and vertical movement of the gear relative to the pinion, which results in the entire surface of the teeth being lapped. This is effected by having the gear spindle journaled in an eccentric sleeve which is oscillated by a cam that is driven from a separate motor. After the gears are placed on the spindles, the action of the machine is entirely automatic. The machine is operated by hydraulic power and the automatic features and timing are electrically-controlled.

The pinion head is moved into and out of operating position hydraulically. This movement is controlled by two hand levers, the first of which chucks the pinion and moves the head in until the pinion is within $\frac{1}{8}$ in. of the gear. The second lever operates a special jogging valve which moves the pinion into mesh, the correct meshing position being determined by a position stop. The chucking of the gear is also hydraulic, controlled by a hand lever.

When the gears are in position, the lapping guard is swung upward, closing the electrical circuit so that the machine can be started. The machine will stop if the guards are opened while the machine is in operation, and it cannot be started again until the guards are closed and the starting button is pushed. The lapping operation is timed by an automatic mechanism, which also functions to shift the lapping cams. It reverses the direction of rotation of the gears at prede-

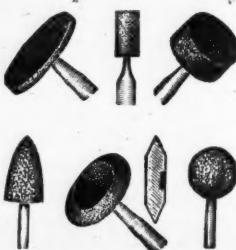
Mounted Grinding Wheels

For all small holes, open or blind-races, bushings, etc., and most any place hard to get at; as on dies, tools, gears, etc. Hundreds of sizes, shapes, any shank.

CHICAGO WHEEL & MFG. CO.

110 South Aberdeen St.
CHICAGO

406 East Woodbridge St.
DETROIT





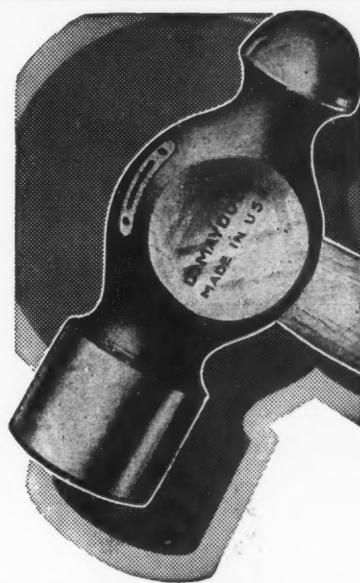
WHEN you put your name on your goods you not only advertise your concern but you increase the value of your merchandise.

Perhaps your marking can be done better with roller dies.

The marking will be the best and cost the least if your dies are made by Schwerdtle.

Write today for more information.

THE SCHWERDTLE STAMP CO.
10 CANNON STREET BRIDGEPORT, CONN.



A Maydole won't tire your arm

TRY a Maydole, swing it, feel its remarkable hang which makes it just as easy to strike the hardest blow as the lightest tap... won't tire your arm. Press-forged tool steel heads, clear second growth hickory handles put into the heads "for good." Your dealer carries Maydoles, ask him.



EXCEPTIONALLY STRONG

Apex Universal Joints are simple in design, have few parts, made of alloy steel and are much stronger than the ordinary commercial joint.

Joints Made To Blue Prints

Get our complete catalogue. Investigate our other money saving tools.

APEX MACHINE CO.
DAYTON, OHIO



UNIVERSAL JOINT NUT SETTERS

For nut running in inaccessible places for hand or power operations with straight shank for welding to hand brace or to fit any portable tool.

Please send a free copy of Pocket Handbook 23 P containing useful tables and information.

Mr.

Street.

City. State.

YOUR HAMMER SINCE 1843
Maydole
Hammers

The David Maydole Hammer Co., Norwich, N.Y.

4

Holes At One Time
With a



U.S. DRILL HEAD

THE U. S. Drill Head changes your one-hole-at-a-time drilling machine into a multiple drill, by allowing any number of holes—fifty if necessary—to be drilled in the same time as one hole.

The particular head shown drills four holes at one time, but we make drill heads to drill any number of holes to meet your requirements.

Send us blue print of your job, and we will show you what you can save by using a U. S. Drill Head.

The United States Drill Head Co.
1954 Riverside Drive

Cincinnati

Ohio, U. S. A.

terminated intervals, and stops the operation of the machine at the time set. Each side of the teeth is lapped by a different movement, controlled by a mechanism that will lift the cam roller, shift the cam and reverse the drive motor, and stop the machine at the correct time. The time for lapping either side may be regulated at from 30 seconds to 33 minutes, and the total time may be varied. When the lapping operation is completed, the opening of the splash guard automatically moves the pinion head away from the gear head far enough so that the pinion may be removed without interfering with the gear. At the same time, the chuck holding the pinion releases. The gear is dechucked by movement of a hand lever which also strips it from the arbor.

The machine is sturdyly constructed. The base is in one piece, of heavy box section. The bearing ways on the frame are of liberal width and narrow guides provide close alignment. The driven head is mounted on a column which can be adjusted both horizontally and vertically. The noses of the spindles are hardened and the bearings are protected by labyrinth seals. An adjustable backlash brake maintains an even load during the lapping operation. The lapping compound is circulated by a pump unit operated by a built-in motor. The machine is operated by a 5 h.p. 1500 or 1800 r.p.m. motor located in the base of the machine, and two small motors for operating the oscillating motion and the compound pump are furnished as standard equipment. The hydraulic mechanism is operated by a central unit having a capacity of $2\frac{1}{2}$ gallons of oil per minute with 150 pounds pressure per sq. in.

Cincinnati No. 2 Milling Machine

Another Cincinnati knee and column type milling machine, known as the No. 2, is now being offered in plain, universal and vertical types by The Cincinnati Milling Machine Co., Cincinnati, Ohio. Sixteen spindle speeds ranging from 20 to 500 r.p.m. and sixteen table feeds ranging from 1 in. to 20 in. are available through an automatic power shift mechanism controlled from either front or rear of the machine. All speed changes are effected by the movement of one lever, the same lever, shifted in the opposite direction, also providing the feed changes.

Complete control from either the front or rear of the machine, including power rapid traverse, is a feature of the ma-

**Anderson Improved
Balancing
Ways**

**No Leveling
Required**

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



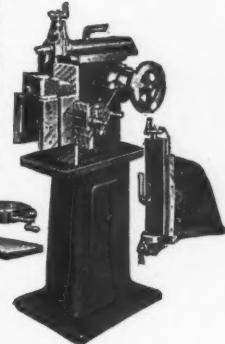
Write For Full Information

Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

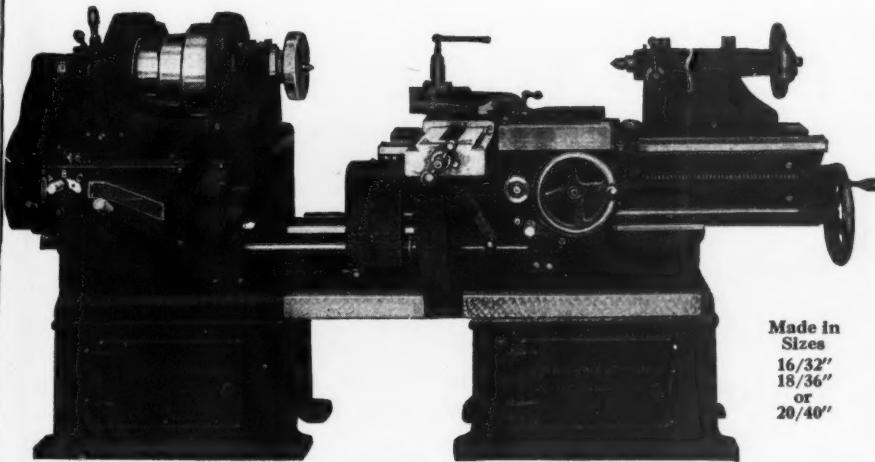
**The RHODES "Convertible"
"Two Machines In One"**

The RHODES "Convertible" Horizontal Shaper and Vertical Slotted—two machines in one—is adaptable to a great variety of uses. It provides an ideal means of handling a large number of small jobs ordinarily assigned to much larger machines, and does the work accurately, speedily and economically.

An illustrated bulletin tells why the Rhodes Convertible is the handiest machine in the shop—send for it!



**THE RHODES MFG. CO.
WALTHAM, MASS.**



Made in
Sizes
16/32"
18/36"
or
20/40"

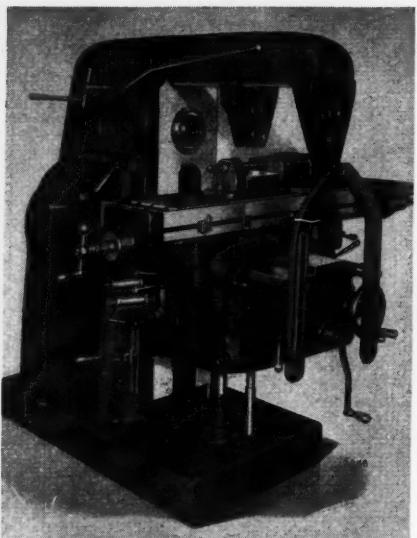
Rahn-Larmon 18/36" Extension Bed Gap Lathe

A lathe for large or small swing work, ready at all times. Requires no extra rigging up. Takes different distances between centers.

Belt driven or with nine speed all geared motor driven head. Tell us what your requirements are and let us quote you.

THE RAHN-LARMON CO.

2935 Spring Grove Ave., Cincinnati, Ohio



Cincinnati No. 2 Plain Miller

chine. These controls include independent directional control for cross, vertical,

or longitudinal movement of the table. Each movement has power rapid traverse either with the spindle stopped or running, at rates of 100 in. per min. for the longitudinal feed and 50 in. for the cross or vertical feeds. The column mechanism, including the entire spindle drive and speed and feed shifting mechanisms, is automatically lubricated by a geared pump located inside the column. The knee is lubricated by a pump and the one-shot system is used for the saddle and table ways.

Practically all parts of the machine have been redesigned and improved, and anti-friction bearings are used throughout. A coolant pump having a capacity of 8 gallons per minute is supplied as regular equipment. The vertical machine has the same general features as the plain or universal machines. The vertical spindle is mounted in a head that is solidly clamped to the frame of the machine. When the screws are loosened, the spindle can be adjusted. Power or hand feed may be used, power feed to the head including power rapid traverse of 25 in. per min. Power feed rates are one-fourth of the rates shown on the feed dial on the machine.

The table working surface of each of the three machines is 49 x 12 in. The vertical machine has a head travel of 6 in. The motor recommended for either

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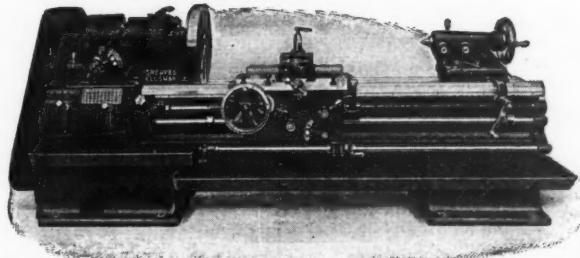
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machine is 5 h.p., 1750 r.p.m. Net weight, motor drive, plain, 5,950 lb.; universal, 6,300 lb.; vertical, 6,450 lb. Floor space required, 98 x 94 in. for the plain and universal machines and 98 x 76 in. for the vertical machine.

"The Cleaning of Metal"

The Magnus Chemical Company, Inc., Garwood, N. J., has published a book dealing with processes, methods, and materials for cleaning all kinds of materials, with practical suggestions for the use of such materials. The text embodies the results that have been obtained through the research of the Magnus Laboratory, which is organized to study cleaning technology. The book has 76 pages, is 6 x 9 in. in size and is profusely illustrated with pictures and drawings showing the various kinds of equipment used for cleaning different classes of work, methods of applying cleaning agents, reactions of materials to cleaning agents, and so on. All the different kinds of tanks, automatic washers, and spraying devices are shown, with full description as to their uses, together with data and suggestions concerning cleaning solutions and processes. The book also contains a glossary of technical words pertaining to the chemical cleaning field, together with several useful tables. This book should be valuable to any plant owner or executive. A copy will be sent without charge to any plant executive who applies on his firm letterhead, giving official title.



Cincinnati Miller Booklets

The Cincinnati Milling Machine Co., Madison and Marburg, Cincinnati, Ohio, has published three new booklets describing the milling machines and cutter grinders made by this company. The booklets are titled "Facts on Features of Cincinnati Hydromatics With Locked Hydraulic Feed," "Facts on Features of No. 2, No. 3 and No. 4 Plain and Universal Millers and Nos. 2 and 3 Vertical Cincinnati Millers," and "Facts on Features of No. 2 Cincinnati Cutter Grinder (Plain and Universal)." Each booklet gives complete facts regarding new features of these machines, new performance facts, and an investment analysis of the machines covered. Copies free upon request.

Goodell-Pratt Catalog No. 17

Catalog No. 17 which has been issued by the Goodell-Pratt Co., Greenfield, Mass., will be of more interest to machine shop executives than any previously issued by this company. The careful regrouping of the many classifications of tools manufactured by this firm and the logical sequence in which they appear makes it apparent that the convenience of the buyer was one of the first considerations in the building of this catalog.

Among the new tools described are several new screw drivers, an automatic drill, new micrometers, a hack saw frame, and others. Copies may be obtained by addressing the company.

A Perpetual Inventory

(Continued from page 38)

ery forced to stand idle. Under the plan outlined here there need be no break in the regular routine. Skilled labor does not have to be paid for tasks which could be performed by clerks; more important, the exact condition of the stock can be determined at any moment by balancing the amounts shown on the tags.

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Pointers on Internal Grinding: A folder containing data on the selection of internal grinding spindles, selection of grinding wheels, methods of holding work, grinding bushings, grinding holes with keyways or slots, and other useful information will be sent free to any machine shop executive. Address Abrasive Company, Tacony and Frankford Streets, Philadelphia, Penna.

Broaching By Modern Methods: Equipment and tools for finishing round, square or irregular-shaped holes and surfaces by broaching are described and illustrated in a booklet that is issued free by the American Broach & Machine Co., Ann Arbor, Michigan.

Ames Dial Gages: The latest types of dial gages for inspection purposes are described in the Ames No. 55 Bulletin, which will be sent free to any machine shop executive. Address B. C. Ames Co., Waltham, Mass.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine stands, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine Co., 200 Davis Ave., Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Franciscus Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Metal and Wood Saws: Catalog No. 20 describing saws of all kinds, for both metal and wood. 256 pages of descriptions of saws and sawing machinery. E. C. Atkins & Co., 402 S. Illinois St., Indianapolis, Ind.

Hold Odd-Shaped Pieces Securely: A vis in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

All-Gear Drilling and Tapping Machines: A catalog describing in detail the various types of all-gear, self-rolling, drilling and tapping machines made by the Barnes Drill Co., 801-851 Chestnut Street, Rockford, Ill., will be sent free upon request.

Modern Drilling Equipment: Circulars describing the various types and sizes of Barnes upright drills, multiple drills and horizontal drilling machines made by this company have been issued by the W. F. & John Barnes Co., Rockford, Ill.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Boker Keyless Chuck: A chuck that is built of three units, grips like a vise, and needs no key is described in a pamphlet that can be obtained by addressing H. Boker Co., Inc., 103 Duane St., New York, N. Y.

"C-V" Chrome Vanadium Wrenches: A complete line of wrenches made of Chrome Vanadium steel—practically unbreakable—is described in a booklet that has been issued by the Bonney Forge & Tool Works, Allentown, Pa. Copy free upon request.

Bradford Precision Lathes: Precision Lathes for the tool room and for general manufacturing purposes, all-gear and cone types, belt or motor driven, are described and illustrated in a catalog that is issued by The Bradford Machine Tool Co., 657-671 Evans St., Cincinnati, Ohio. The catalog also includes descriptions of taper, relieving, turret and other lathe attachments. Sent free upon request.

Mark Tools or Parts: Metals are easily marked by the Etchograph—an electrical unit that can be used with any light circuit. For particulars address William Brewster Company, 52 Church St., New York, N. Y.

How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

High Speed Drill Presses: A complete line of drill presses that can be run at high speeds with complete safety is described in catalog number 50, issued by the Canedy-Otto Manufacturing Company, Chicago Heights, Ill. This catalog also contains descriptions of other equipment manufactured by this concern. Sent free upon request.

Gears Of All Kinds are described and illustrated, with specifications, in Catalog 90, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

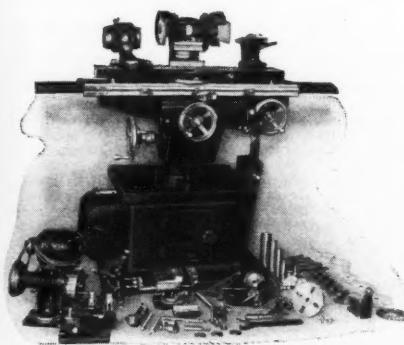
Mounted Grinding Wheels for grinding very small holes or holes of unusual shape are described and illustrated in a bulletin which can be had by addressing the Chicago Wheel & Mfg. Co., 110 S. Aberdeen Street, Chicago, Ill.

Grinding the Centerless Way: The advantages of the centerless grinding method is discussed in a booklet which also describes the centerless grinding machines made by Cincinnati Grinders, Inc., Cincinnati, Ohio. The illustrations show various types of jobs in process, and full data is included. Copy free upon request.

Cincinnati Hydromatics With Locked Hydraulic Feed is the title of a book that describes in detail the new type of automatic milling machine with hydraulic feed which has been developed by The Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio. Copy free to any machine shop executive.

Rapid Traverse Planers: Cincinnati Hypo Planers, made by the Cincinnati Planer Co., Cincinnati, Ohio, are described in a new catalog that has been issued by this company.

Bolender Gear Burnishers: Gears will operate more smoothly and more silently if burnished. Full description of the Bolender Gear Burnisher can be had by



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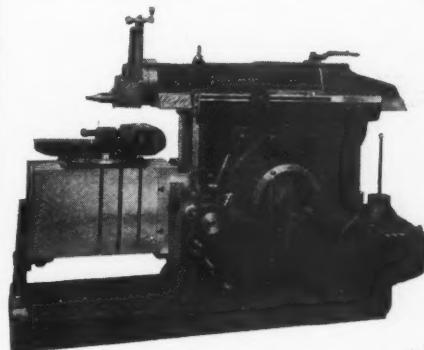
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addressing the City Machine & Tool Works, Third and June Sts., Dayton, Ohio.

Handbook For Drillers: The Cleveland Twist Drill Co., 1242 E. Forty-ninth St., Cleveland, Ohio, has published a book in which the various parts of the twist drill are described, and which tells how to grind a drill correctly. The troubles that result from incorrect grinding are described and illustrated and several chapters are devoted to the subjects of speeds, feeds, materials, cutting compounds, and so on. Sent free upon request.

Columbia Superior Shapers: Bulletin No. 17, issued by The Columbia Machine Tool Co., Hamilton, Ohio, describes and illustrates the line of heavy duty shapers made by this firm. Copy free upon request.

Columbia Tool Steel Handbook: A book containing valuable information concerning the making of tools, heat treating, use of hardness testing instruments, use of the quenching bath, drawing bath, and other heat treating equipment, and together with tables and other useful information can be obtained without charge by addressing the Columbia Tool Steel Co., 550 E. 14th St., Chicago Heights, Ill.

Table of Hardness Scales giving in parallel columns corresponding figures in Rockwell, Shore and Brinell, with table of size and capacity of broaches made by the Connecticut Broach & Machine Co., New London, Conn., on reverse side, can be had by addressing this company. Particularly useful in heat treat department. Without charge.

Die Makers' Supplies: A complete line of die sets, leader pins, bushings, and other die makers' supplies are described in a book that is issued by the Danly Machine Specialties, Inc., 2104 South 52nd Avenue, Chicago, Ill. Sent free upon request.

Davis Keyseaters: Recent developments in keyseating methods are discussed in a bulletin that also describes the keyseaters made by the Davis Keyseater Company, 250 Mill St., Rochester, N. Y. Copy free upon request.

Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Precision Grinding: A booklet which describes and illustrates the most modern methods of performing all kinds of precision grinding operations, showing how the Dumore grinder can be applied to various kinds of machine tools, has been published by The Dumore Company, Racine, Wis. Copy free upon request.

Interchangeable High Production Tools: Catalog No. 28, issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

Grooved Cast Iron Pulleys: All sizes of grooved cast iron pulleys, made by Efficient Machine Shop, 147 Baxter St., New York City, are listed in a circular that can be had by writing this firm.

Lathe Turrets of eight different types and twelve sizes are described and illustrated in Circular No. 18, issued by Fay & Scott, Dexter, Maine. Copies free upon request.

Precision Measuring Instruments: The latest types and models of dial indicators, thread lead test gages, pitch gages, thickness gages, dial comparators, and other precision measuring instruments marketed by the Federal Products Corporation, Providence, R. I., are described and illustrated in a book that will be sent free upon application to this firm.

The Involute Gear Simply Explained: A direct, clear explanation of the theory and principles of involute gearing without the use of higher mathematics can be obtained without charge by addressing The Fellows Gear Shaper Co., 78 River St., Springfield, Vt.

Questions To Ask Before Buying a Jig-Boring Machine: A list of the fine points to look for in a jig-boring

machine, with descriptions and illustrations of the working parts of the Swiss Jig Borer, can be obtained by addressing The E. Y. Ferner Co., 1511 K St., N. W., Washington, D. C.

Formica Silent Composition Gears: A booklet telling about the uses and advantages of Formica Silent Shock Absorbing Gears, and containing a considerable amount of valuable data with rules and tables for laying out, cutting and using gears. Sent free by Formica Insulation Co., 4632 Spring Grove Avenue, Cincinnati, Ohio.

Fosdick Drills: This publication gives details as to the design and construction of Fosdick Radial, Upright, and Sensitive Drills. Published by the Fosdick Machine Tool Co., Cincinnati, Ohio.

Modern Grinding Equipment: The complete line of universal tool and cutter grinders, surface grinders, drill grinders, tap grinders, and other grinding machines made by the Gallmeyer & Livingston Co., 336 Straight St., S. W., Grand Rapids, Michigan, is described in a series of bulletins that have been issued by this firm. Free upon request.

Flat Surface Grinding: Automatic, semi-automatic, and single-purpose machines for performing all kinds of grinding operations on flat surfaces are described and illustrated in a book that has been issued by the Gardner Machine Company, Beloit, Wis. Copy free upon application.

Adjustable Blade Cutters: Hollow mills, facing tools, face mills, milling cutters and other production tools with adjustable, interchangeable blades are described and illustrated in a booklet that is issued free by the Genesee Manufacturing Co., 141 N. Water St., Rochester, N. Y.

Take Care of Your Tools by keeping them in a convenient, strong, and fine-looking chest. A catalog of tool chests, complete with descriptions and illustrations, can be had by addressing H. Gerstner & Sons, 1283 Columbia Street, Dayton, Ohio.

Dynamic and Static Balance: Full information as to what static and dynamic balance means, the necessity of correct balance in rotating parts, methods of discovering and correcting unbalance, and the uses of balancing equipment can be had without charge by addressing Globe Tool & Engineering Co., Dayton, Ohio.

Machine Vises of all sizes for use with machine shop equipment are described in a circular that will be sent free upon application to The Graham Mfg. Co., 69 Willard Ave., Providence, R. I.

Greaves-Klusman Lathes: A book containing complete descriptions of the latest types of lathes made by this firm has been issued by the Greaves-Klusman Tool Co., Oakley, Cincinnati, Ohio.

Swiss Files: The complete line of Grobet Swiss Files for use in die and tool work or for other fine work is described and illustrated in Catalog "K," published by the Grobet File Corporation of America, 3 Park Place, New York, N. Y. Copy free upon request.

Drawing Tables: The Hamilton steel-base, adjustable drawing table is described in Catalog No. 7-MS, issued by the Hamilton Mfg. Co., Two Rivers, Wis. Copy free upon request.

Grinding, Polishing and Buffing Machines of the latest types are described and illustrated in a series of bulletins that have been issued by the Hammond Machinery Builders, Kalamazoo, Mich. Copies free upon request.

Universal Drill Jig: The John's Universal Drill Jig can be used for drilling, centering, milling, reaming, tapping, and other operations with slight changes. Descriptive circular can be had by addressing the Heuser Manufacturing Co., 1638 N. Paulina St., Chicago, Ill.

Texdrive Grinders for Vitrified or High Speed Wheels: A six-page bulletin No. 43 describes in detail and illustrates the advantages of the new Hisey Texdrive Grinder —stressing especially the multi-speed and single-speed machines. Write for a copy to The Hisey-Wolf Machine Co., Colerain and Marshall Sts., Cincinnati, O.

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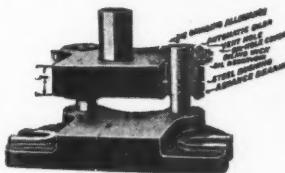
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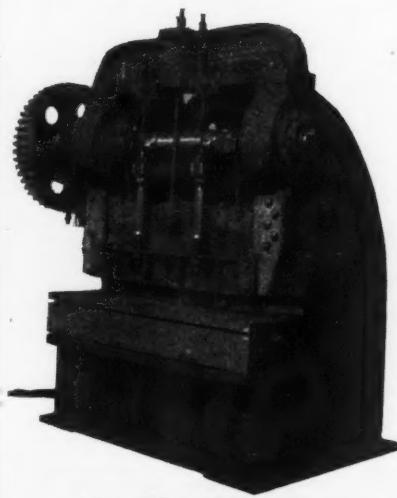


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Speed Reducers: A catalog of speed reducers up to 200 h.p. and built to deliver any ratio desired in standard size units can be obtained by addressing The Horsburgh & Scott Co., 5110 Hamilton Ave., Cleveland, Ohio. Give firm name.

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"Houghton's Refrigerant Base" and "Hoest" — metal cutting oils manufactured by E. F. Houghton & Co., Philadelphia, Penna., are fully discussed, together with their outstanding properties, in two booklets which can be obtained without charge by addressing this firm.

"Do It Electrically": The complete line of "Thor" universal electric tools, including tools for drilling, reaming, screw-driving, tapping, nut-setting, grinding, and for performing other operations is described in Catalog No. 17, issued free by the Independent Pneumatic Tool Co., 236 S. Jefferson St., Chicago, Ill.

Tool Room Equipment: Jig borers, vertical shapers, die relieving lathes, tool milling machines, button die grinding machines, and other tool room equipment are described in a catalog issued by the Index Machinery Corporation, 49 Central Ave., Cincinnati, O. Copy free upon request.

Tool Steel Composition, Selection, and Heat Treatment: William Jessop & Sons, Inc., 121 Varick St., New York, N. Y., has published a series of pamphlets dealing with the above subjects. Copies free upon request.

Special Mill-Wauke-Mil's of Standard Units: A milling machine of which the base, heads, columns, and other parts are built in standard units, thus enabling the user to order a machine that will be especially adapted for his job, is described and illustrated in Catalog No. 36, issued by the Kearney & Trecker Corporation, Milwaukee, Wis. Free to machine shop executives.

Keller Automatic Toolroom Machine for machining dies, metal patterns, jigs, core boxes, molds, and other irregular parts is fully described in a booklet that can be had free by addressing the Keller Mechanical Engineering Corp., 84 Front Street, Brooklyn, N. Y.

Koehel-Wagner Diamonds for Wheel Dressing: The Koehel-Wagner method of mounting diamonds and the use of the "Dykon" gage are discussed in a bulletin issued by the Koehel-Wagner Corporation, 144 Orange St., Newark, N. J. Free upon request.

Drill Around Corners: Holes can be drilled in close quarters by the use of the Koza Right Angle Drill. Can also be used for keywaying or countersinking. A descriptive pamphlet can be had by addressing Chas. A. Koza, 464 Augustine St., Rochester, N. Y.

Lathe Dogs and C Clamps are described and illustrated in Catalog No. 80, issued by the W. G. LeCount Tool Works, South Norwalk, Conn. Copy free upon request.

Air-Operated Work-Holding Devices: A booklet showing how air-operated chucks and devices of various kinds can be applied to different kinds of machines to save time and labor has been issued by The Logansport Machine Co., Logansport, Ind.

Punching and Shearing Machines of the most modern design are described and illustrated in a series of bulletins that can be obtained without charge by addressing The Long & Allstatter Co., Hamilton, Ohio.

Rapid-Reading Micrometer: A new type of rapid-reading micrometer, designed to show the reading in numerals, is described in Catalog No. 5, issued by The

Lufkin Rule Co., Saginaw, Michigan. The catalog also contains descriptions of the micrometers, calipers, gauges, scales, squares, bevel protractors, and other tools made by this company. Free upon request.

"A Captain of Industry." Pocket Handbook 23-P, issued by The David Maydole Hammer Co., Norwich, N. Y., tells how David Maydole came to make what he considered the best hammer in the world, and also includes descriptions of the various types of Maydole hammers. Several useful tables are included. Copy free upon request.

Time Saving Machine Equipment: How machining time can be reduced to the minimum by the use of Wizard chucks, collets and tap holders, turret tool posts, self-centering steadyrests, and other McCrosky equipment is told in a book that is issued by the McCrosky Tool Corporation, Meadville, Penna. Will be sent without charge.

Midwest Pin Drive Keyway Cutters are described and illustrated in a catalog that can be had by addressing Midwest Tool & Mfg. Co., 2362 West Jefferson Ave., Detroit, Michigan.

Polish at Any Speed: The Mitchell motor-driven polishing lathe, in which herringbone gears are used to transmit power from the motor shaft to the lathe spindle, can be operated at any desired speed. Bulletin can be obtained by addressing the Mitchell Engineering Co., Springfield, Ohio.

Nateo Drilling, Tapping, and Boring Equipment is the title of a publication that has been issued by The National Automatic Tool Co., Richmond, Ind. The book gives details as to construction and uses of "Nateo" multiple drilling and tapping machines.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Save Time with Expanding Mandrels: How expanding mandrels will solve the problem of turning pieces with odd-size holes, and will increase production on duplicate work is told in a folder that will be sent free upon request by W. H. Nicholson & Son, 136 Oregon St., Wilkes-Barre, Pa.

Live Centers: The complete line of live centers manufactured by Nielsen, Inc., of Lawton, Mich., are fully described in a bulletin issued by this company. This bulletin is illustrated with photographs and blueprints of the Nielsen Center. Mailed free upon request.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norton-Hoffmann Bearings Corporation, Stamford, Conn.

How To Grind Cemented Tungsten Carbide: A booklet which describes and illustrates the correct methods of grinding tungsten carbide tools has been published by the Norton Company, Worcester, Mass. Copy free upon request.

Correct Cutter and Tool Grinding: Grinder Booklet "E," which is illustrated with 48 photographs, tells how to grind tools correctly and economically. It shows how a solid-backed cutting edge reduces cutter costs and increases production per grind. A copy will be sent free by addressing The Oesterlein Machine Company, 3301 Colerain Avenue, Cincinnati, O.

Dies Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

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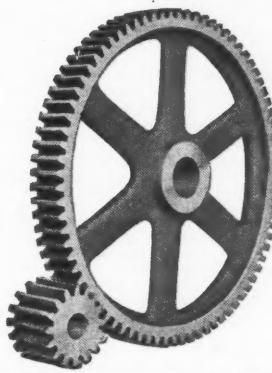
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Engine, Turret, and Gap Lathes: are described in a series of bulletins that have been issued by The Rahn-Larmon Co., 2985 Spring Grove Ave., Cincinnati, Ohio.

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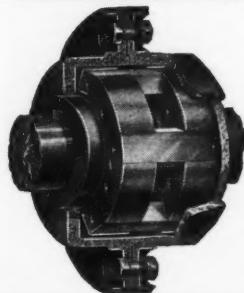
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Screw Machine Products: Full information as to the manufacturing service on screw machine products maintained by Western Screw Products Co., 19-31 St. George St., St. Louis, Mo., will be sent upon request.

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Modern Machine Shop 127



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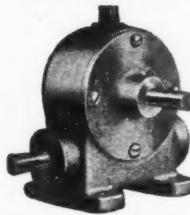
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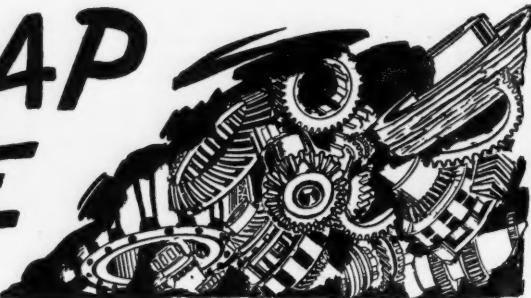
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By GEO. ALEXANDER MANN



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Side by side,
Always together,
"Cyanide."

The big guffaw is on the chap who buys a Scotch plaid suit an' then kicks 'cause it's tight.

In many instances 'tis
Wise to look dumb.

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He said to Miss Peck—
She said, "Well, stop groping,
They're not 'round my neck."

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be consistent—wear a "crash" suit.

Answer Me That

What's more excitin'?
It thrills one a lot,
Openin' your laundry
An' find what you got.

Now we have night golf an' night baseball. It's 'bout got so we can do everything at night but sleep.

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You buy a drug-store sandwich,
All wrapped up nice an' neat,
Then they sell you a telescope,
To help you find the meat.

If all buyers were price buyers,
junk would be the one thing sold.

It takes hot tips to keep you in a cold sweat.

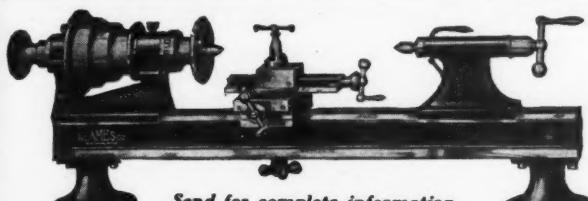
Oh Shoot

The Chicagoite don't worry,
No furrows in his dome;
Anywhere he hangs his gat
To him is home, sweet home.

The hardest thing in life is makin' easy payments.

Sez Mike

I got a new sweetie,
I fell in a lump,
She's the garbage man's daughter,
An' owns a swell dump.



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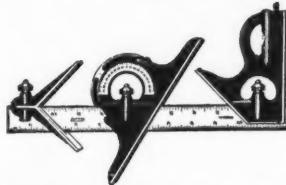
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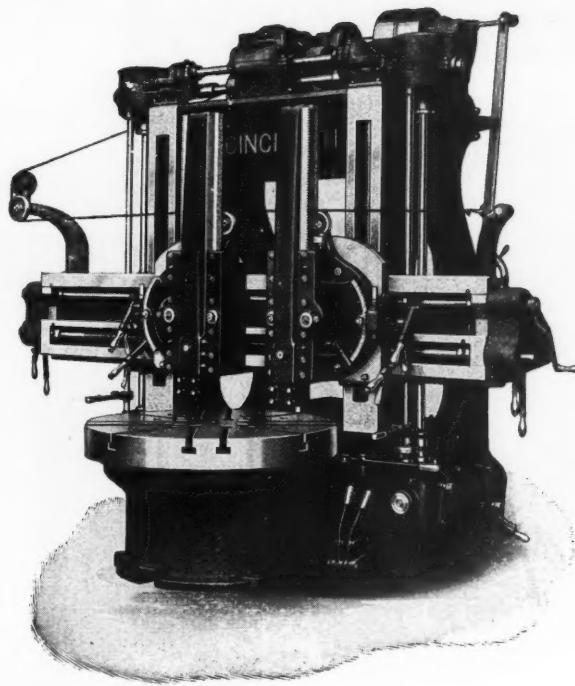
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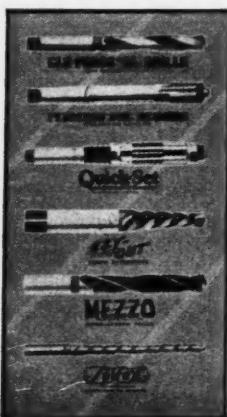
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SPECIALISTS IN TWIST DRILLS AND REAMERS

Yes, we would like to receive forms and instructions for making the cost per hole test. Also Digest No. 82.

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Pull All You Want— You can't break a Bonney

PROVE it to yourself. Take any Bonney *CV Chrome Vanadium Wrench—socket, open-end or box. Put it on a nut or bolt and see if you can break the wrench.

You can pull all you want. In the end you may strip the thread or break the bolt. But the wrench won't be damaged.

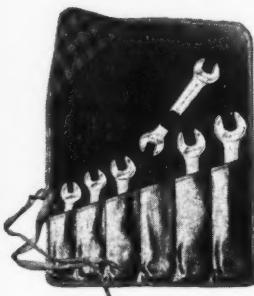
And the reason is so simple. Chrome Vanadium used in Bonney *CV Chrome Vanadium Wrenches is an alloy steel. It has many outstanding qualities, the most important of which is its strength. Bonney Wrenches forged of Chrome Vanadium properly Heat Treated are guaranteed not to break, yet are lighter in weight than ordinary wrenches.

That's one reason why most mechanics prefer and use Bonney *CV Chrome Vanadium Wrenches.



ENGINEERS' WRENCH SET No. 25

Designed for work in close quarters. This set contains 6 double-end Engineers' type 15° angle wrenches with 12 different size openings of $\frac{3}{8}$ ", $\frac{7}{16}$ ", $\frac{1}{2}$ ", $1\frac{1}{8}$ 2", $\frac{9}{16}$ ", $1\frac{1}{16}$ ", $\frac{5}{8}$ ", $2\frac{5}{3}$ 2", $\frac{3}{4}$ ", $\frac{7}{8}$ ", $1\frac{5}{16}$ " and 1".



Engineers' Wrench Set No. 25
Price, \$8.65

BONNEY FORGE & TOOLWORKS ALLEGTON, PA.

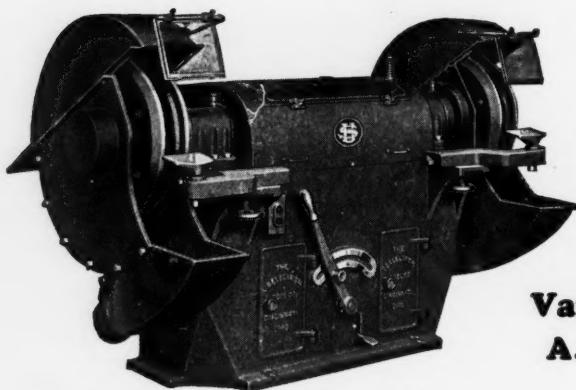
Makers of Special Service Wrenches of Chrome Vanadium, Carbon Steel Drop Forged Wrenches, Pipe Wrenches, and Drop Forgings

*CV is a Bonney trademark registered in the U. S. Patent Office



Patents Pending

Chrome Vanadium registered August 11, 1925



(Pat. No. 1477052. Other Pats. Pend.)

U. S. Variable Speed A. C. Grinder

Constant Speed down to the flanges!

LOWER costs! Bigger production! Better results! These are what you get with this powerful, 6-ball-bearing grinder. It maintains a constant wheel surface speed regardless of wheel wear, that's one of the big reasons why. Even in high speed snagging at 9,000 surface feet per minute. Ask your distributor or write us for all the facts.

U. S. MULTISPEED BUFFERS also embody the patented Gibbs V-Disc Transmission—enabling you to secure four different wheel speeds.

The famous Gibbs V-Disc Transmission of GRAPHITIZED MICARTA which makes constant speed possible, is not new. In many other uses for years it has shown highest efficiency, as in grinding. It's free from slip and back lash. It's easily accessible—easy to operate—quiet—durable—low in replacement cost. It's patented.



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